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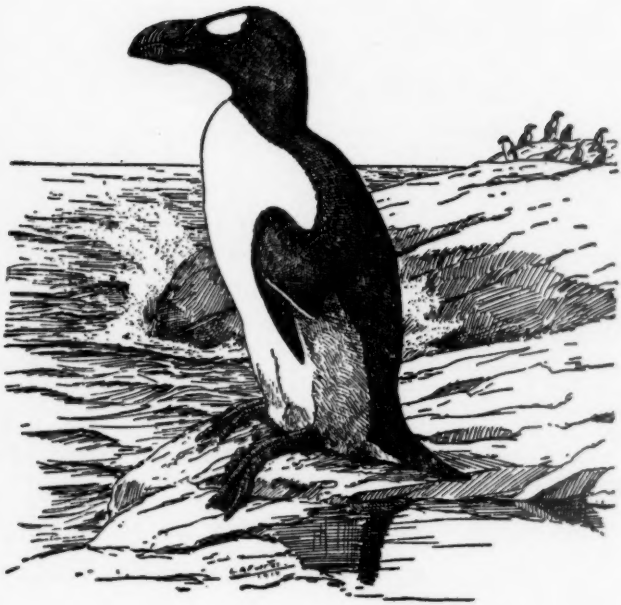

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THE CAHOW, *Pterodroma cahow*, PAINTED BY ROGER TORY PETERSON.

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THE RELATIONSHIPS OF CERTAIN BIRDS AS INDICATED BY THEIR EGG WHITE PROTEINS

BY ROBERT A. MCCABE AND HAROLD F. DEUTSCH

INTRODUCTION

THIS paper attempts to forge a new taxonomic tool from techniques used in chemistry and field ornithology.

Mayr (1942: 45), speaking about the phenomena of geographic variation in relation to systematics, stated that "Small physiological differences between populations, subspecies and species are often more important biologically than the accompanying structural differences." The basic premise to be developed in this paper is that the protein composition of egg white is a physiological character that can be used in the study of avian taxonomy.

The method utilized in this study of the protein composition of egg white is termed electrophoresis. It may be briefly defined as the migration of charged colloidal particles to the pole of opposite charge when solutions of colloidal materials such as proteins are placed in an electric field.

Inasmuch as this paper is directed to an ornithological audience, further clarification on method and chemical terminology is in order. The electrophoretic study of the protein composition of a given egg white is carried out by the moving boundary method (Tiselius, 1937). This implies in part that the individual molecules of a solution of egg white proteins at a given pH in an electric field will move at different rates toward either the positive or negative pole. The speed of movement of each kind of protein molecule depends in part on its electric charge. Likewise, the quantity of the components is recorded photographically as a refractive index function and represented as a series of peaks, each of which will arbitrarily be expressed as a curve similar in configuration to a frequency distribution curve (Figs. 1 through 7). The ordinates on the electrophoretic pattern represent gradients in

refractive indices, *i. e.* protein concentration, and the abscissae indicate the position of each protein component in respect to the total distance moved in the course of an experiment. The electrophoretic pattern can be enlarged and the area below each peak planimetered to give a rough measure of each component. For taxonomic purposes this is (as yet) unimportant. Likewise we need not concern ourselves with the salt boundaries (anomalies) in the patterns which are labeled with the Greek letters δ and ϵ for the ascending (left) and descending (right) patterns respectively. They represent the approximate starting points for all of the protein molecules. Further detailed information on electrophoresis was adequately given in the papers of Longsworth (1942) and of Alberty (1948).

Previous electrophoretic work on the egg white proteins of wild birds was carried out by Bain and Deutsch (1947). Proteins of several closely related species were compared, but no mention was made by these or previous investigators of the possible taxonomic value of the results. They did however point out greater similarities among closely related species. Our earliest suspicion of phylogenetic relationships came with the examination of the electrophoretic patterns of the egg white proteins of the Coot, *Fulica americana*, and Florida Gallinule, *Gallinula chloropus cachinnans* (Fig. 2B), two birds from separate genera of the family Rallidae. A close relationship of the various proteins as indicated by similarities of their electrophoretic patterns showed that the two birds were in this respect physiologically similar. Despite over-all similarity, there were sufficient differences to make each pattern distinct. With this and the previous work as an incentive, we made further comparisons of egg white proteins to check this method with those based on orthodox taxonomic characters.

ACKNOWLEDGMENTS

The writers wish to express their gratitude to Joseph J. Hickey for many helpful suggestions and for editing the manuscript; Ernst Mayr for encouragement and sound advice; Dean Amadon and Jean Delacour for advice and constructive criticism; H. Albert Hochbaum and Lyle K. Sowls of the Delta Waterfowl Research Station for sending us eggs of the various ducks; and the Wisconsin Conservation Department, whose game farm at Poynette, Wisconsin, made available the eggs of the exotic game birds. We wish to thank Miss Phyllis Merrill for blocking in the electrophoretic tracings. Appreciation is also extended to James F. Crow, Marie S. McCabe, and Patricia Murrish for advice and help in manuscript revisions.

This work was supported in part by a grant from the Wisconsin Alumni Research Foundation.

METHODS

The first step in the analysis was to obtain fresh eggs from wild birds. It is here that the techniques of field ornithology are brought to bear. A knowledge of the nesting habits, phenology, and the breeding cycle of each species is essential. It is inherent in wild birds to disguise, conceal, or secrete their nests, so that to obtain eggs the nests must first be located. The difficulties in all but the commonest species need no elaboration.

Completed clutches were first thought to be undesirable because in most species one or more of the eggs would have had some incubation. This is evidenced by the irregular time (*i. e.* on successive days) of hatching in most songbirds. It was further thought that incubation, even for a short period, might drastically alter the protein structure in the albumin. Recent work by Marshall and Deutsch (1950) on chicken egg white showed, however, that this was not the case. They stated (p. 160) "During the development of the chick embryo, the proteins of the egg white and of the amniotic fluid appear to remain in the same relative proportion in which they are present in fresh egg white." In this study, however, no eggs from completed clutches were used and to our knowledge all eggs were fresh.

The egg shell was punctured around the middle and the contents run onto a clean chemical watch glass. If the vitelline membrane surrounding the yolk ruptured, the egg was not used. Special care was taken to remove as thoroughly as possible the egg white adhering to the inner surface of the shell and to the vitelline membrane. This was accomplished by means of a small pipette. This material was then mixed with three volumes of a diethyl barbiturate buffer (pH 8.6 and ionic strength of 0.1) and gently homogenized. The buffer maintains a constant pH which is necessary to the electrophoretic processing. Unless the sample was used immediately, it was quick-frozen with the help of a dry ice and alcohol bath and stored at $-10°$ to $-15°$ C. When needed, the material was brought back to a liquid state and dialyzed from 48 to 96 hours at 0° to 2° C. against changes of buffer and then analyzed electrophoretically. The insoluble mucous strands and chalazae were removed after an initial 48-hour dialysis and discarded. The duration of the experiment was usually 10,800 seconds with a constant potential gradient of between 5.8 and 6.3 volts per cm.

The photographs of the protein composition by the electrophoretic apparatus were taken on small plates. These were enlarged, redrawn, and blocked in with India ink, as shown in the various figures. All

discernible peaks were regarded as separate protein components, analyzed,[1] and numbered in order of increasing electrophoretic mobility. It must be recognized that the selection of components is at times arbitrary, particularly in cases showing poor electrophoretic separation. The numbers on the patterns are not to be compared between diagrams, but merely represent protein molecules of an electrophoretic mobility within a restricted range. The width of each pattern is dependent on the duration of the experiment, the amount of current utilized, and the electrophoretic mobility of the proteins. The important function for a given protein molecule is its electrophoretic mobility, and the unequal widths of the various diagrams in no way invalidate the comparisons.

The electrophoretic diagrams for the egg white proteins of the Domestic Chicken, Turkey, and Guinea Hen, the Muscovy and common Mallard Duck, Ring-necked Pheasant, Coot, Black Tern, English Sparrow, Rock Dove, and Ringed Turtle Dove were presented previously by Bain and Deutsch (1947). These diagrams were reanalyzed for the greatest number of discernible components and not as was done previously, for entities supposedly related to known proteins of chicken egg white. The inclusion of these electrophoretic diagrams is important for a consideration of their relationships to many of the other egg white systems reported here for the first time.

The number of eggs used in each sample varied. Only one egg was available for the large exotic gallinaceous birds. The ducks were represented by two to six eggs per sample and the songbirds by four to eight eggs.

Larger numbers of eggs would seem desirable, but interpolating from the Domestic Chicken, there appears to be virtually no variation in egg white proteins among eggs of a clutch or between clutches of different chickens. Many dozens of chicken eggs have been analyzed electrophoretically in the process of purification of their egg white protein components so that variations, if they existed, would have been detected.

The nomenclature and taxonomy unless otherwise stated were taken from the fourth edition of the A.O.U. 'Check-list of North American Birds' (1931) and Peters' 'Check-list Birds of the World,' Volume 2 (1934), for the remaining foreign species.

DISCUSSION

Delacour and Mayr (1945) reclassified the duck family Anatidae "to arrange the species in related groups and in a natural sequence,

[1] The analytical data showing the quantity of each component and its mobility rating for each species can be obtained in tabular form by writing H. F. Deutsch, Department of Physiological Chemistry, University of Wisconsin, Madison, Wisconsin.

and to adjust the nomenclature of species and genera to progressive concepts of these categories." A review of that paper will reveal that these ends were thoroughly and effectively accomplished. The ducks were regrouped by the use of morphology and also by characters available to the ecologist, behaviorist, and field worker. The basis for the reclassification was in part the bird's general behavior and courtship, its living and nesting habits, and the down pattern of the young. Such criteria can readily be seen by the nonsystematist.

The Delacour-Mayr grouping of the "river ducks" puts all but four "aberrant" species (each in a monotypic genus) into the genus *Anas*. With this single genus as a base datum, we electrophoretically examined the egg white proteins of five species of river ducks. The electrophoretic patterns are shown in Figure 1A. It is at once clear that the five river ducks show strikingly similar electrophoretic patterns, yet each is sufficiently distinct so that the patterns are not confused. Thus it appears from examination of a comparable physiological character (egg white protein) that the river ducks are *very* closely related; therefore, limited as our evidence may be, it shows that the justification for a single genus as proposed by Delacour and Mayr is well-founded. It might also mean that the method employed here is most useful above the generic level.

Unfortunately we have only one member of the pochard group to add to the comparison. The pattern for the Redhead, *Aythya americana*, is shown in Figure 1B. This pattern is so much like that of the river ducks that it might well be considered as being from that group. What this means we cannot say until more experiments on the egg whites of other species of this genus are run. From this single instance it might be inferred that pochards are more closely related to river ducks than to any other group. This is further emphasized when the egg white pattern of the Redhead is compared with that of a perching duck, the Muscovy, *Cairina moschata*, and that of a stiff-tailed duck, the North American Ruddy Duck, *Oxyura jamaicensis* (Fig. 2A). In these comparisons it is likewise plain that the egg white diagram for the Muscovy is intermediate in configuration between those of the river ducks and that of the radically different Ruddy Duck. All this, including the close resemblance of the Redhead to the river ducks, further substantiates the division of the Anatidae made by Delacour and Mayr.

From the family Rallidae we have the electrophoretic patterns for the egg white proteins of the Florida Gallinule and the American Coot. The patterns (Fig. 2B) show the two are quite similar and also that the suspected protein components are the same in number. The

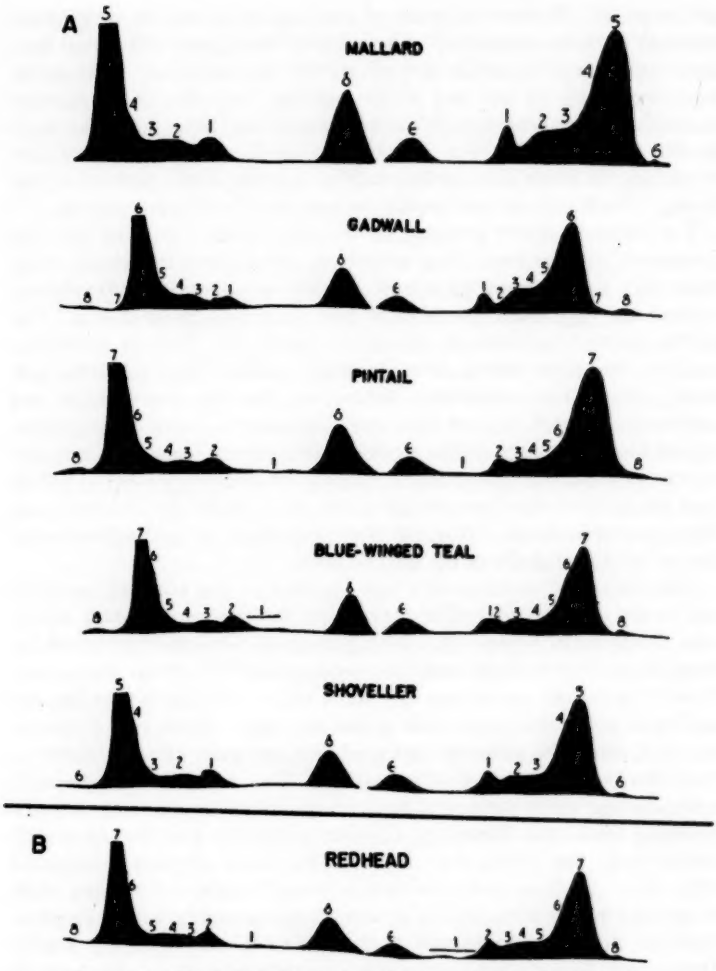

FIGURE 1. Electrophoretic patterns for some species of waterfowl.

patterns for the Purple Gallinule, *Porphyrula martinica*, and the European Coot, *Fulica atra*, when made will present interesting inter- and intra-generic comparisons.

The two other water birds for which we have patterns (Fig. 3A) are the Black Tern, *Chlidonias nigra*, and the Pied-billed Grebe, *Podilym-*

bus podiceps. These are presented merely to show the differences between distantly related groups.

The patterns (Fig. 3B) of the Ringed Turtle Dove, *Streptopelia risoria*, and the Rock Dove, *Columba livia*, show less inter-generic similarity than any others we examined. In general the physiology, morphology, behavior, and life history of these two doves imply a closer relationship than their egg white patterns indicate.

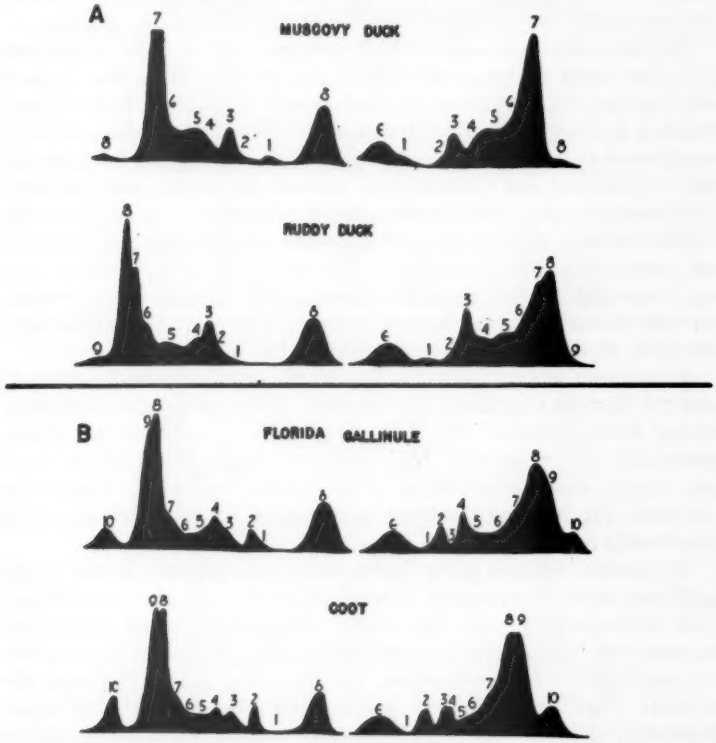

FIGURE 2. Electrophoretic patterns for two species of waterfowl and two species of marsh birds.

Collections of birds' eggs for this study were governed primarily by availability and expedience. We have, however, seven patterns to compare among the passerine birds. The first (Fig. 4A) is an inter-generic comparison between the Catbird, *Dumetella carolinensis*, and the Brown Thrasher, *Toxostoma rufum*. The resemblance between

the two is very clear despite definite analytical differences. It would be interesting to have an analysis for the remaining member (in eastern United States) of the family Mimidae for comparison, namely the Eastern Mockingbird, *Mimus polyglottos*. From the closely related family Turdidae the electrophoretic patterns for the Robin, *Turdus migratorius*, and Bluebird, *Sialia sialis*, are shown in Figure 4B. The interfamily comparison shows a definite affinity of the two groups. The Bluebird pattern bears a closer relationship to the patterns of the two species of Mimidae than to that of the Robin.

The two generic patterns in the thrush group show wider differences than are found between the two mimid genera. Note the plateau between the peak components on both sides of the pattern in the Robin, which is wanting in the Bluebird pattern. From appearances alone it would seem that there is a closer phylogenetic relationship between the Brown Thrasher and Catbird than between the Robin and Bluebird. This seems to agree with the morphological evidence which shows the Catbird to be a slightly aberrant thrasher. The Robin and Bluebird are morphologically dissimilar in many ways. In the latter case again we would like to have been able to present the egg white patterns for the Varied Thrush, *Ixoreus naevius*, and the "brown-backed" thrushes, *Hylocichla* spp., to mention but two genera.

A European weaver finch (the English Sparrow—*Passer domesticus*), and the Eastern Goldfinch, *Spinus tristis*, show very little conformity in egg white patterns (Fig. 4D), despite their being classed phylogenetically as "advanced" bird families. This fact, however, need not imply close relationship. The Cedar Waxwing, *Bombycilla cedrorum* (Fig. 4C) and Goldfinch patterns are not too dissimilar as an interfamily relation.

The remaining large group for which we have patterns is that of the galliform birds, representing three families, Phasianidae, Numididae, and Meleagrididae. In the family Phasianidae eight genera are represented, four of these by a single species. Of the genera with two or more species for comparison, the first (Fig. 5A) is between the Chukar Partridge, *Alectoris graeca*, and the French Red-legged Partridge, *Alectoris rufa*. The electrophoretic pattern for the latter species is somewhat more complex, but the similarities are obvious. The taxonomic juxtaposition appears justifiable when these patterns are compared with that of the Bobwhite Quail, *Colinus virginianus* (Fig. 5B) where the similarities are less pronounced, as they should be since the comparison is between genera of two subfamilies. *Colinus* is in the subfamily of American quails, Odontophorinae, and *Alectoris* is in the subfamily of partridges, quails, and pheasants, Phasianinae.

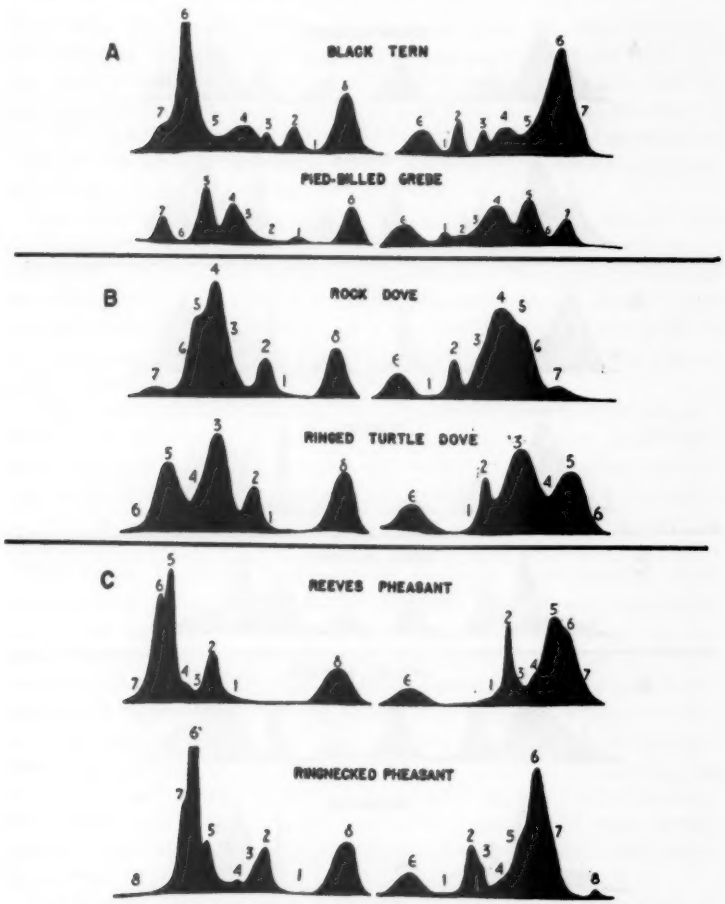

FIGURE 3. Electrophoretic patterns for a miscellaneous group of birds.

The *Alectoris* group lies taxonomically between the genus *Gennaeus* and the genus *Colinus*, but shows no closer affinity to one than the other. Beebe (1921) treated the Nepal and White-crested kaleeges and the Silver Pheasant as separate species, *Gennaeus leucomelanus*, *G. albocristatus*, and *G. nycthemerus*. Peters (1934) considered the two kaleeges as subspecies and the Silver Pheasant as a distinct species, that is, *Gennaeus l. leucomelanos*, *G. l. hamiltonii*, and *G. nycthemerus*. Delacour (1949) reclassified these birds into the genus *Lophura* and

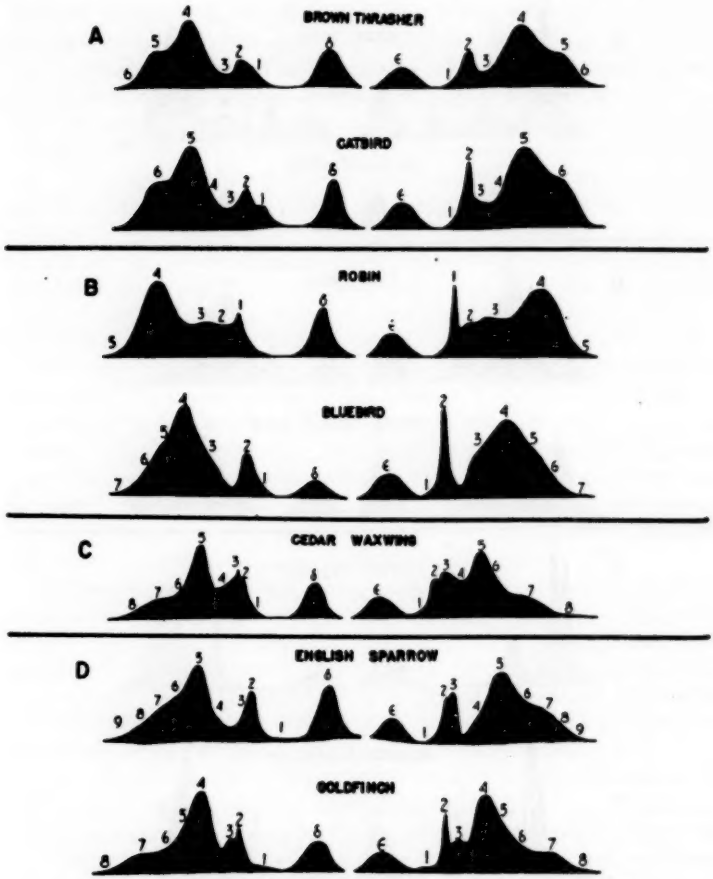

FIGURE 4. Electrophoretic patterns for a group of passerine birds.

as members of a superspecies, *L. leucomelana-nycthemera*. The two kaleeges are treated as subspecies, *L. l. leucomelana* and *L. l. hamiltoni*, and the Silver Pheasant as a species, *L. n. nycthemera*. Delacour (1949: 188) stated of the early classification of the gallopheasants "Such splitting was then perfectly understandable in accordance with the fashion of the day." By the same token one might consider the present day "lumping" tendencies to be a fashion also, awaiting to be split again by taxonomists in the future. Regardless of the published

taxonomic treatments, this much is clear from the electrophoretic patterns—the two kaleege patterns (Fig. 6A) are neither easily grouped nor readily contrasted with the Silver Pheasant. It might even be said that the pattern of the White-crested Kaleege is more like that of the Silver Pheasant than that of the Nepal Kaleege. As members of a genus, this trio has egg white proteins whose electrophoretic properties are surprisingly uniform.

The next three genera, *Gallus*, *Phasianus*, and *Syrmaticus*, are represented by the Red Jungle Fowl (*Gallus gallus*), the Ring-necked Pheasant (*Phasianus colchicus*), and the Reeves Pheasant (*Syrmaticus reevesii*), respectively. Each of these patterns is distinct, showing only enough similarity to be associated at a family level. Two patterns are shown in Figure 3C; the Red Jungle Fowl (Fig. 5C) will be used in a later comparison.

The patterns (Fig. 6B) for the Golden Pheasant, *Chrysolophus pictus*, and the Lady Amherst Pheasant, *Chrysolophus amherstiae*, show a marked similarity despite the presence of the component of high mobility in the latter pattern. It would not have been surprising in view of the present evidence had these two birds been classed as subspecies.

The Green Peafowl, *Pavo muticus*, and the Blue Peafowl, *Pavo cristatus* (Fig. 7A) show differences sufficient that a species classification seems logical. When the peafowl eggs were received from the State Game Farm one of the egg-sample labels read *Green or Black-shouldered Peafowl*. This was an obvious mislabeling since the Black-shouldered Peafowl is a mutation of the Blue Peafowl. This mutation was discussed in detail by Delacour (1951). The rather distinct differences between this pattern and that of the Blue Peafowl led us to suspect that the egg white sample came from the Green Peafowl. The Golden and Lady Amherst pheasants appear to be more closely related to the kaleeges than to members of the genus *Gallus*, *Phasianus*, *Syrmaticus*, or *Pavo*, according to the respective patterns.

The Guinea Hen, *Numida meleagris*, of the family Numididae is surprisingly similar in its pattern to the genus *Pavo* of the family Phasianidae. The number of suspected proteins is greater in the Peafowl, but the conformity is obvious, even to the split in the main peak on the left half of the pattern. No such similarity is apparent in the comparison (Fig. 7B) with the Domestic Turkey, *Meleagris gallopavo*, of the family Meleagrididea. The physiochemical evidence indicates a closer relationship of the Guinea Hen with the Peafowl than with the Turkey. On the basis of egg white proteins alone, the Guinea Hen could be placed in the genus *Pavo* of the family Phasi-

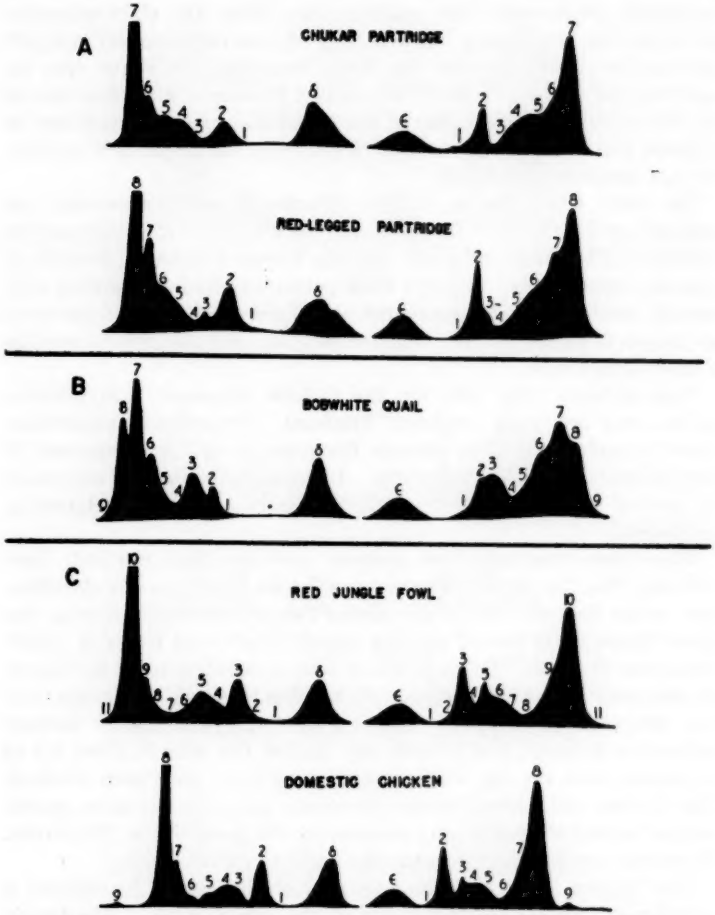

FIGURE 5. Electrophoretic patterns for a group of gallinaceous birds.

anidae. Greater inter-generic differences exist in other patterns than was indicated between these members of different families.

No systematic study has been made of the differences between the egg whites in all varieties of domestic fowl, but sample runs from several varieties indicate there is little or no difference among the commercial egg-producing chickens. The pattern used here (Fig. 5C) was made from pooled egg whites of White Leghorns.

Color, size, shape, etc. are characters, selected for in poultry husbandry, that make for morphological differences among the numerous varieties of chickens. If this selectivity can be considered rapid and relatively recent, then the composition of the egg white proteins for which there is apparently no selection should retain a pattern similar to that of the Red Jungle Fowl, *Gallus gallus*, which is generally considered to be the parent stock from which the Domestic Chicken has been developed. The comparison of patterns (Fig. 5C) shows a marked similarity between the two, despite the sharp peaks and numerous components involved. Here is an instance of known, although artificial, selection producing changes (*i. e.*, color, size, etc.) that are likewise known to be taking place in other birds in the wild through natural selection.

The conformity of the egg white patterns of the Domestic Chicken and the Red Jungle Fowl is clearly evident.

We found, as stated earlier, that some of the results of this electrophoretic process substantiate the taxonomy based primarily on morphology and also the more recent use of behavior, nidiology, down pattern of the young, etc. This outcome was not surprising. Hinton (1940), for example, found that his classification of the Mexican Water Beetles, *Elmidae*, based on internal anatomy, corroborated most of the taxonomy based on external morphology. In our work complete agreement was not hoped for or achieved.

In some cases the results suggest a closer relationship than is now shown by morphological criteria, *e. g.* the genus *Aythya* with the "river ducks" or the Guinea Fowl, *Numida*, with the Peafowl, *Pavo*. In other instances the relationship appears to be more distant, as between the Rock Dove, *Columba livia*, and the Turtle Dove, *Streptopelia risoria*, and between the Robin, *Turdus migratorius*, and the Bluebird, *Sialia sialis*.

One point that appears obvious from the electrophoretic studies is that the method is more sensitive above the level of the genus than below. Differences between families are clearly indicated, *e. g.* Anatidae and Phasianidae. Despite the apparent utility of this check on avian taxonomy, further work on its relative reliability is necessary before it can be accepted as a standard tool.

Some of the avian groups that might profit from a comparative study of the electrophoretic properties of the egg white proteins are as follows: Mockingbird family with the wrens; the Goldfinch, *Spinus tristis*, and Purple Finches, *Carpodacus purpureus*, with the American buntings; the sandpipers with the phalaropes; the nuthatches with the bush-tits and wren-tits; the goatsuckers with the owls; the cuckoos with

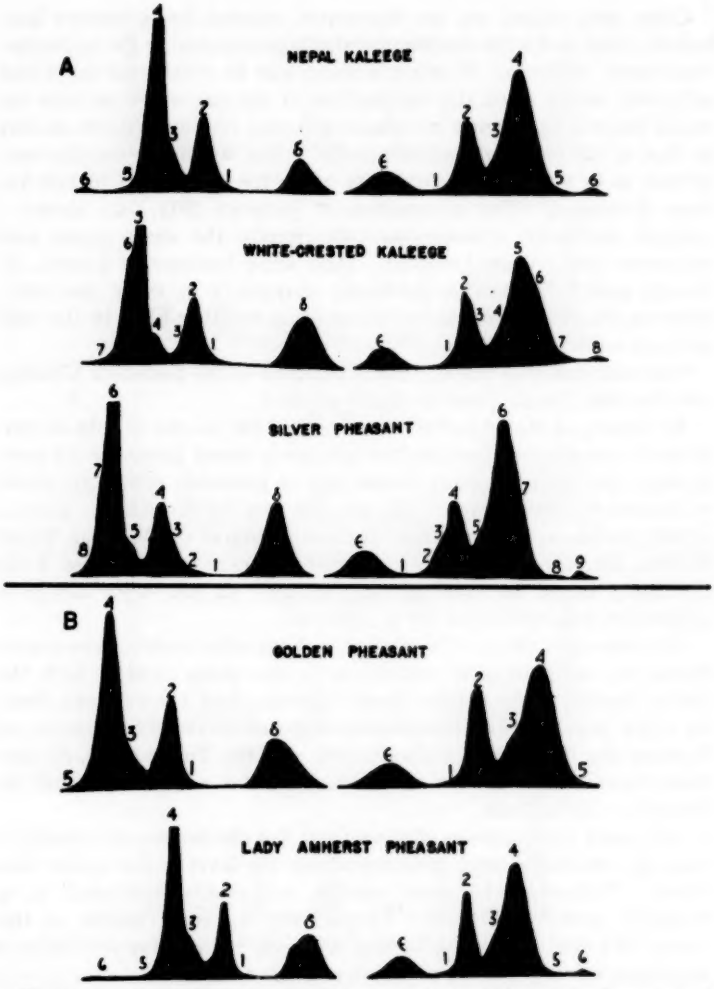

FIGURE 6. Electrophoretic patterns for some birds of the genera *Gennaeus* and *Chrysolophus*.

the gallinaceous birds; and American vultures with the hawks. Some individual comparisons worthy of investigation are: the Wood Duck, *Aix sponsa*, with the Muscovy Duck, *Cairina moschata;* the Song Sparrow, *Melospiza melodia*, with the Field Sparrow, *Spizella pusilla*, and Chipping Sparrow, *Spizella passerina*, and Old World buntings; the Cardinal, *Richmondena cardinalis*, with the Indigo Bunting, *Passerina cyanea*, and tanagers; and the Yellow-breasted Chat, *Icteria virens*, with the tanagers and wood warblers. This list is by no means complete, but does indicate that the problems are many and are not confined to any one taxonomic group.

Taxonomic relationships deduced from the comparison of the electrophoretic properties of egg white protein must be regarded as indicative only because of the extreme complexity of this protein system. There may exist many more proteins than are indicated under the present experimental conditions, *i. e.*, certain numbered components may consist of two or more proteins. Studies and recognition of the function of the individual proteins in the various species will be essential to this problem. Moreover, the number of egg whites studied electrophoretically to date is comparatively small.

The nature of the data, however, encourages speculation. The following discussion may serve to stimulate thinking and uncover leads for future work along these lines.

The use of egg white proteins as a common denominator to show relationships among birds need not and likely could not replace morphological characters, but it would clarify at a more fundamental level those groups or individuals that appear aberrant by present taxonomic standards. It seems possible that the physiochemical character of an egg retains more of its incipient phylogeny than the more superficial aspects of the bird's adult morphology. The survival value of a stout bill, wing size, particular coloration, and the like appear to be of greater importance than the protein composition of the egg white (at least as of our present state of knowledge regarding egg white proteins). Selective factors very likely operate rapidly and drastically at a morphological level and thus divergence may become apparent in a relatively short space of evolutionary time. The selection for factors affecting egg white proteins is probably slow, indirect, and less drastic. This, if true, would allow the various branches of a given phylogenetic stalk to retain a physiological lineage with the parent stalk, while the external modifications among the species tend to mask that relationship; witness the Galapagos finches. These finches bring up still another point. Lack (1947) mentioned that there is considerable doubt as to the nearest mainland relative of these island finches. An

investigation of egg white proteins might shed light on this and other aspects of the relationships among these birds.

The problem of avian affinities on archipelagos has been further investigated by Amadon (1950) on the Hawaiian Islands. His work was done on a family of Honey Creepers (Drepaniidae). This fine

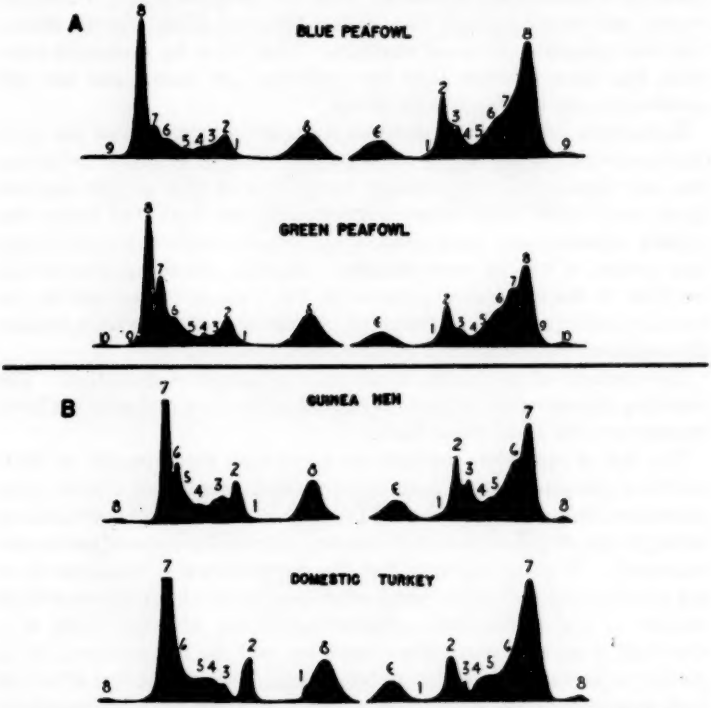

FIGURE 7. Electrophoretic patterns for members of the family Phasianidae (A); and the families Numididae and Meleagrididae (B).

work notwithstanding, Amadon stated (p. 253), "The primitive Drepanids are perhaps most like some of the Coerebidae, but the latter may be only thin-billed Thraupidae. The anatomical characters involved are so slight and inconstant that derivation of the Drepaniidae from any of the thinner-billed American groups of nine-primaried song birds, such as the Parulidae or Icteridae, cannot be ruled out." Here then is a case where morphology and anatomy have failed to give a systematist sufficient evidence to indicate the proper taxonomic posi-

tion of a group of birds. We suggest that a relationship may be evident on examination of the egg white proteins of these birds.

It is not inconceivable that relationships among birds may be studied by an interchange of albumin or the addition and subtraction of fractionated components between closely grouped forms. This type of experimentation could also test whether the albumin with its various components has any effect on gene action. If growth and differentiation of the embryonic chick are in part dependent on the albumin for food and environment, then any change in the ecology of the minute embryo could alter the appearance or functioning of the end product, namely the young bird.

Many of the components of chicken egg white have been isolated, studied and some functions made known. Research has already been carried out on various domestic birds as regards immunological relationships of some of the egg white components (Landsteiner, 1945; and Wetter, L. R., M. Cohn, and H. F. Deutsch, unpubl. data Univ. of Wis.). Other recent work in the field of immunology has uncovered some important facts that bear on this general problem. Irwin (1949: 119) stated "It is interesting that these species [doves of the genus *Streptopelia*] can be differentiated sharply by antigenic substances in either cells or serum, whereas certain measurable morphological characteristics—such as over-all length and extent, length of wing, beak, tarsus, middle toe, and tail feathers—do not permit a differentiation except on statistical bases." Although the above research was not concerned with taxonomy the indications are that, like the electrophoresis of egg white proteins, the antigenic substance in the blood, egg white, and tissues could serve to help clarify the taxonomic position of forms not readily classified by morphological characters.

Although we realize that this discussion section is largely speculation and that our data are limited, we hope the speculation has been provocative. It must be kept in mind that this approach to taxonomy and evolution is in a pilot stage and that no claims are made as to its eventual practicability.

SUMMARY

Electrophoresis, which is a method for studying certain properties of soluble proteins, was used to study the egg white composition of 37 species of birds' eggs. The results, which are expressed as blocked-in line graphs and commonly referred to as electrophoretic patterns, show similarities in configuration between some of the birds that are considered closely related taxonomically. In other instances these

patterns indicate a more distant relationship than is indicated in the present taxonomic position. No patterns were completely identical. Thus, each species has a distinct pattern of its own, which may show marked similarities to the pattern of other species. This relationship among birds using the egg white proteins as a common denominator is thought by the writers to be a tool in augmenting the present taxonomic procedure.

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IN MEMORIAM: FLORENCE MERRIAM BAILEY

BY PAUL H. OEHSER

FLORENCE MERRIAM BAILEY was the first woman ever elected a Fellow of the American Ornithologists' Union. This honor, which came to her in 1929, she had sound reason to cherish; in her family the A.O.U. naturally held high status, inasmuch as her older brother, Clinton Hart Merriam, was one of its founders. Furthermore, the Bureau of Biological Survey, of which her brother was the first chief and in which her husband, Vernon Bailey, spent a lifetime of service, had its roots in the Union. Florence was proud of her brother and his scientific accomplishments, and in her brief account in 'Who's Who in America' she was content to be listed simply as "interested in ornithology" (a classic understatement) and as the "sister of Clinton Hart Merriam."

Florence Augusta Merriam was born on August 8, 1863, at Locust Grove, New York, the daughter of Clinton Levi and Caroline (Hart) Merriam. The little town of Locust Grove is in Lewis County, in the Black River Valley, near the present village of Port Leyden, in the shadow of the Adirondacks. The Merriam estate, "Homewood," was a country place with ample acres and ready opportunities for young people to study natural history first-hand. Florence must have acquired an interest in such matters at an early age, probably through the encouragement of her brother Hart and of her father. We know that her father did have an interest in scientific matters, for there is on record (*in* Badè's 'The Life and Letters of John Muir') a long letter from Muir answering some questions the elder Merriam had apparently put to him concerning the glaciation in Yosemite Valley, California, following a visit he made Muir at Yosemite in the summer of 1871.

On both parents' sides Florence Merriam was descended from old American stock. Her father's line went back to Joseph Merriam who about 1636 came to America from Kent, England, and settled in Concord, Massachusetts. Clinton Levi Merriam (1824–1900), her father, was a native of Leyden, N. Y. As a young man he followed mercantile pursuits in Utica, N. Y., but in 1847 he moved to New York City and became an importer and later engaged in banking. About the time that Florence was born the family returned to Locust Grove, and a few years later Mr. Merriam was elected Republican Representative to the United States Congress from his district; he remained in Congress four years (1871–1875).

Florence's mother was the daughter of Levi Hart, of Collinsville, N. Y., a judge of the county court and member of the State Assembly. Caroline Hart was a graduate of Rutgers Female Institute in New York, one of the earliest women's colleges. Perhaps this affiliation was to influence Florence's education, for following her preparatory training at a private school in Utica she entered Smith College at Northampton, Mass., a newly founded non-sectarian institution for women only. She spent four undergraduate years at Smith and there formed many lasting friendships.

For some reason, however, she did not receive her degree with her college class (1886), and in the autumn of that year we find her writing to her classmates: "I have been doing Audubon work combined with that most abhorred and abhorrable occupation of plain sewing, with housekeeping and bookkeeping, and am taking a P. G. course in business with my father. In the meantime I have not forgotten the B. L. that I did not get last June, and when I have graduated from receipt books and ledgers I hope to become one of the proud alumnae of dear '86." She was not granted her degree until many years later, in 1921, but at Smith she was always considered a member of the class of 1886.

During all this time her interest in ornithology was, without doubt, uppermost, in spite of these domestic distractions she writes about, and even while at college she was spending days afield, sometimes leading groups of students, and becoming that incomparable mistress of birdlore for which she was to be famous. During her last year at Smith College her beautifully written articles began appearing in the 'Audubon Magazine.' Then she proceeded to revise and add to these articles, and in 1889 they went into her first book, 'Birds Through an Opera Glass,' published by Houghton Mifflin & Co., in its Riverside Library for Young People. It is rare indeed that an author at only 26 years of age produces a work so charming, unpretentious, and useful. This little volume set her style as a writer, as well as the type of ornithologist she was to become. On both counts it was good. Her simple purpose was to help "not only young observers but also laymen to know the common birds they see about them."

Besides the study of birds, which she pursued in earnest, Miss Merriam became interested in social work. In the summer of 1891 she spent a month in the "summer school" that had been started for Chicago working girls as a branch of Jane Addams's Hull House activities, and the following winter she was employed in one of Grace Dodge's working girls' clubs in New York City. But about this time, or before, she developed tuberculosis, and it seemed best for her to

take the "west" cure. She had already spent one spring (1889) in California, and in 1894 she went west again. She attended six months of lectures at Leland Stanford Junior University, and then in the spring, the bird-nesting season, she was off to Twin Oaks, in a small valley in San Diego County, Calif., observing the birds and taking notes that later went into her book 'A-Birding on a Bronco.' "Then," she writes, "I went to the San Francisco Mountain country in Arizona for a final dose of climate." From her brother's home in Washington, D. C., the next December she wrote: "I have come back from it [the "wonderful" Arizona climate] so well that I expect to spend the winter here and to give courses of 'bird talks' to boot." That winter she was busy also in the Women's National Science Club, working "to get women to start branches in the country."

For awhile during her western trip, Miss Merriam had stayed at a little Utah town, where she took occasion to observe not only the local avian inhabitants of the country but also the human inhabitants. She wrote up her experiences there in her book 'My Summer in a Morman Village,' which was published in 1895. She did not altogether approve of some of the characteristics and customs of the Latter-Day Saints, and though there is much in the book about mountain scenery, horseback riding, Great Salt Lake, and nature in general, Miss Merriam did not entirely hide her feelings concerning the Mormons.

The next year saw the publication of her delightful 'A-Birding on a Bronco,' and two years later came 'Birds of Village and Field,' a book for beginners in ornithology and one of the first popular American bird guides. It contains simple field color-keys for identifications and more than 200 drawings by Ernest Thompson Seton, Louis Agassiz Fuertes, and John L. Ridgway.

These four early books of Miss Merriam's belonged to a class apart and represented a genre of nature writing found, among her contemporaries, in such writers as Bradford Torrey, Frank Bolles, Sara Anderson Hubbard, Olive Thorne Miller, Dallas Lore Sharp, and the two Johns—Muir and Burroughs. Florence Merriam was not the least of this group, and even today the charm of these volumes, which she wrote before her marriage, has not faded. She was one of the most literary ornithologists of her time, combining an intense love of birds and remarkable powers of observation with a fine talent for writing and a high reverence for science. She made a definite contribution to nature writing, a form of literature that in America has indigenous roots; nature, indeed, is the eternal spring that has given important parts of American literature its greatest vitality.

Her brother Hart, as chief of the Biological Survey, had engaged an energetic naturalist, Vernon Bailey, in the work of making biological field studies, especially in the West. Young Bailey lived at the Merriam home, and so it was inevitable that he should meet Hart's sister; and, if it can be said of any couple, it could be said of Florence Merriam and Vernon Bailey—they were made for each other. They were married on December 16, 1899, and thereafter made their home in Washington, D. C., first at the Merriams' on Sixteenth Street, then at the corner of Nineteenth and California Streets, and finally at the home they built on the oak-wooded site at 1834 Kalorama Road.

Almost immediately Vernon began a series of field trips for the Biological Survey that were to continue for many years. Sometimes alone but frequently accompanied by Mrs. Bailey, he covered New Mexico systematically, probably as thoroughly as any state has ever been worked biologically. Vernon collected and studied mammals, birds, reptiles, and plants, and Florence observed the birds. During the next 30 years they worked also in Texas, California, Arizona, the Pacific Northwest, and the Dakotas. Mrs. Bailey wrote up her ornithological observations made on all these trips, and they appeared for the most part in a long succession of papers in 'The Auk,' 'Bird-Lore,' and 'The Condor.' She was no "woman tenderfoot," and the wagon trips across the prairies and the pack-outfit travel in the western mountains, in those early days of the century, were not to be laughed off. Though not a robust woman, and as a girl threatened with tuberculosis, she developed a wonderful vitality, both physically and mentally. The rich experiences of the outdoors, especially in the great Southwest which she loved, the companionship of her husband, and the stimulation of the work they were accomplishing—these were the rewards of the arduous life she chose to pursue.

In 1895 had appeared the first edition of Frank M. Chapman's 'Handbook of Birds of Eastern North America.' Who better than Florence Merriam Bailey to do a companion volume for the West? She must have spent assiduous hours at this task in the two or three years following her marriage, for the book appeared in 1902, with 600 pages and as many illustrations. In its various editions the 'Handbook of Birds of the Western United States' has been a standard work now for half a century, and how many bird students during that time must have first known the name Florence Merriam Bailey through its pages! I have a letter from Olaus J. Murie that testifies to this and also precisely describes the kind of book it was and the manner of its author.

"My first knowledge of Mrs. Bailey," writes Murie, who knew her well in later years, "was my purchase of her Handbook of Birds of the

Western United States, the blue-covered edition of 1908. I have just taken this battered copy from the bookshelf, and in the preface I note her meticulous care in stating the corrections in this and announcing that '*Astragalinus* has been revised in the text to accord with the rulings of the American Ornithologists' Union.' But throughout the book, following the necessary technical descriptions, are the delightful informal accounts of the birds, accounts that help to make each bird something of flesh and blood, a living thing. Some of these she wrote herself; some are by Vernon Bailey. She drew her accounts from whatever source was competent—first-hand experiences of Dr. E. W. Nelson, on the Alaska tundra, or of L. M. Loomis [off Monterey Bay] . . . Revering science with a deep devotion, and with skilled first-hand experience, she still saw more in a specimen than a skin. In her scientific writings, even her handbook, she did her best to bring the outdoors into its pages."

During all her active years in Washington, Mrs. Bailey was a tireless member and promoter of the Audubon Society of the District of Columbia. She was one of the founders of the Society when it was organized in 1897. One of the Society's first projects was the preparation of 'Birds of Washington and Vicinity,' by Mrs. Lucy Warren Maynard, which was published in 1898 and was introduced as a text-book in the District of Columbia schools. Miss Merriam, experienced in the publication of bird books, inspired and aided this project. That same year the first of the Society's famous bird classes was organized, aimed primarily to furnish basic instruction in both field and laboratory ornithology at the normal-school level to teachers of nature study. Early leaders and instructors in the work were T. S. Palmer, H. C. Oberholser, Sylvester D. Judd, and Wells W. Cooke, all then on the Biological Survey staff. Mrs. Bailey was the prime mover of this group of volunteer Audubon workers, and year after year saw her teaching the bird classes or directing the work, always a guiding spirit. By 1902 there were five classes, aggregating 50 or 60 members, and by 1913 it took a dozen or more teachers to accommodate the membership of between one and two hundred. To Mrs. Bailey must be given the principal credit for the popularity and success of this rather remarkable activity which continued for more than a quarter of a century.

The Bailey home on Kalorama Road, between Eighteenth Street and Columbia Road, was a mecca for naturalists of all breeds and varieties. No one who visited there in the old days will forget it. Whether it were some young tenderfoot mammal collector like Clarence Birdseye, then probably little dreaming of frozen foods, or some

eminent person like John Burroughs (in his Journal he records having dined at Mrs. Bailey's in February, 1906)—all were welcome and felt at home in the Baileys' inviting second-floor library and living room filled with books and pictures. One remembers especially the octagonal dining room, the fireplaces, the American Indian rugs and baskets the Baileys had collected on their western trips, Vernon's mammals and humane traps in the basement, the backyard, with its oaks and squirrels and birds (but no cats!). There was also the unique show piece on the panel of the library fireplace—a portrait of a fine Bengal tiger then living in the National Zoological Park, painted in repose by the wildlife muralist, Charles R. Knight. In 1949 Mr. Knight wrote me: "I remember both Vernon and Florence saying that they had built their house around the tiger picture, which I had promised to do for them before the place was actually constructed. The panel seemed always to give these two splendid friends the greatest amount of satisfaction, and I am wondering what will become of it." That question can now be answered. Mrs. Bailey bequeathed the picture to the Smithsonian Institution, where it is now permanently deposited in the National Collection of Fine Arts.

For some years after the death of Prof. Wells W. Cooke in 1916, his projected work on the birdlife of New Mexico, which he had undertaken for the Biological Survey, remained uncompleted. Finally, Dr. E. W. Nelson, then chief of the Survey, asked Mrs. Bailey to complete the volume for publication. She was a logical choice, for she had been with her husband during the years beginning in 1903 when, as the Bureau's chief field naturalist, he was making the Survey's thorough biological investigations in New Mexico. Furthermore, she knew the western birds perhaps as no other person did. It remained for her to recheck and bring down to date Professor Cooke's records and data, fill in the gaps, then produce a manuscript according to the enlarged scope prescribed by Dr. Nelson. Under the aegis of the Biological Survey the task was completed, and 'Birds of New Mexico' appeared in 1928. This was published by the New Mexico Department of Game and Fish. Containing some of Maj. Allan Brooks's best bird portraits in color, the book was the first comprehensive report on the birdlife of the Southwest. In 1931 Mrs. Bailey was awarded the Brewster Medal of the A.O.U. for this, her *magnum opus*. She was the first woman ever to receive this honor, and two years later the University of New Mexico awarded her an honorary LL.D. degree "in recognition of the educational and scientific value of her work on Birds of New Mexico." Vernon Bailey's companion work on 'Mammals of New Mexico' was published by the Biological Survey in 1931. The two works together form a landmark in western natural history.

FLORENCE MERRIAM BAILEY, May, 1915. Photograph from the Deane Collection of the Library of Congress.

The companionship that existed between Florence and Vernon Bailey was something that was enriching to all who knew them. Childless, they were both children at heart. They had a common devotion, their love for nature, in which they found their greatest pleasure—but their devotion to each other transcended that. It was an affinity of the spirit that is attained by few in this life. It is not something easily described, yet it should not go unmentioned in any account of the two. It was not a selfish devotion. Murie remarks: "Their ambition in little or big things was to be helpful, to do service. Both would be delighted in the discovery of some young person who had promise of good influence. 'Leaven the lump!' was a favorite saying of Florence Bailey on such occasions."

Mrs. Bailey possessed a gentle, feminine personality but at the same time a forceful one. In spite of her preoccupation with things of the wild, she was a humanitarian, taking an eager interest in educational, child-welfare, and other affairs. She loved all wholesome things and wholesome living; she hated all forms of cruelty and was uncharitable toward many of the degrading influences of modern life. She held firmly to principles and ideas. Those who knew her well will remember, too, many amusing traits she had. One was her short manner on the telephone. When she had finished a conversation she "hung up," without any of the customary but meaningless formalities or valedictories. This was characteristic. There was no room in her life for fripperies.

Her last work of any magnitude, 'Among the Birds in the Grand Canyon National Park,' was published by the National Park Service in 1939, when she was past 75. Also should be mentioned the fact that she contributed the bird sections to some of her husband's works, including 'Wild Animals of Glacier National Park' (1918) and 'Cave Life of Kentucky' (1933). Others of her more important papers will be familiar to many bird students simply by their suggestive titles: "Red Letter Days in Southern California," "Birds Recorded from the Santa Rita Mountains in Southern Arizona," "Characteristic Birds of the Dakota Prairies," "A Return to the Dakota Lake Region," "Wild Life of an Alkaline Lake," "Meeting Spring Half Way," "A Populous Shore," In A. C. Bent's "Life Histories of North American Birds," Mrs. Bailey is among the authorities most frequently quoted on bird habits and behavior, particularly in the volumes dealing with the smaller species.

As an ornithologist Mrs. Bailey had little or no concern with such matters as taxonomy except as a means to an end, and that end was to familiarize others in an orderly and interesting way with her beloved

birds. I do not know that she ever named a new form. Her forte was elsewhere—observing and describing what she saw afield. In her writings she made use of the work of others, some thought inordinately, but this was through no lack of knowledge of her own but rather because of a wide acquaintance with and a conscientious awareness of avian literature and an ability to "step up" her own enthusiasms and observations with those of others. Her "literary luggage" (to use a phrase of the British author C. E. Montague) was anything but meager, yet she never carried it ostentatiously.

When Vernon Bailey retired from the Biological Survey in 1933, the two planned to spend their winters at their "ranch" near San Diego, Calif., but the aging couple soon found that "roughing it" is better for young people; it was easier to live in Washington. After Vernon died in 1942, Florence kept on at the Bailey home, but she was to survive her husband by only six years. Her death, which occurred in Washington on September 22, 1948, passed unnoted by many of her admirers of long ago. But on that day there departed a true friend of birds, a sweet and unselfish spirit, and altogether a most unusual woman. The Reverend John Van Schaick, Jr., the well-known Universalist editor and writer, also a member of the A.O.U., conducted the funeral service in Washington. Burial was at the old Merriam home place at Locust Grove, N. Y.

Besides her long affiliation with the A.O.U. (first elected in 1885, the first woman associate member), Mrs. Bailey was a member of the Cooper Ornithological Club, the Wilson Ornithological Club, the National Audubon Society, and the Biological Society of Washington.

It is of interest that Mrs. Bailey's name was memorialized in ornithology by Dr. Joseph Grinnell in 1908, when he gave the subspecific name *baileyae* to a form of chickadee (now known as *Parus gambeli baileyae*) from the higher mountains of southern California.

For material used in the preparation of this memorial, I am indebted especially to the following persons: Mrs. Margaret S. Grierson, archivist of Smith College, Northampton, Mass.; Charles R. Knight, of New York City; Dr. Olaus J. Murie, of Moose, Wyo.; and Dr. T. S. Palmer, of Washington, D. C. I have also drawn from my shorter and more intimate account of Mrs. Bailey published in the March, 1950, issue of 'Nature Magazine.'

Smithsonian Institution, Washington 25, D. C., September 19, 1951.

PRINCIPLES AND PRACTICES IN COLLECTING AND TAXONOMIC WORK[1]

BY JOSSELYN VAN TYNE

THE taxonomist has the very difficult task of gathering a large number of sample specimens from the earth's surface, processing them, studying and recording their characteristics and variations, summarizing the facts discovered, and then publishing the conclusions in such carefully chosen words that all of his readers will understand exactly what he means.

It is clear that there are scores of opportunities for introducing errors all through this process, and we shall be wise to stop now and then to see how we can improve our techniques and eliminate sources of error.

When I was asked to discuss this subject, I began by requesting nearly two dozen of the leading men in bird taxonomy for their comments on the practices which had caused them difficulty in their work and for suggestions on improved standards and techniques which they would like to see adopted. Their replies were extremely interesting and are the basis for my selection of the following points.

PREPARATION OF SPECIMENS.—There are several good books and pamphlets on this subject, and yet my associates are of the opinion that certain rules of technique are commonly neglected. These are:

1) "*Stripping the ulna.*" In order to save a few seconds in the process of skinning small birds, some collectors "strip" the secondaries from their attachment to the ulna. Conscientious collectors who follow this practice make every effort, when filling out and arranging the skin, to restore the secondaries to their exact original position, but long experience demonstrates that it is not possible to be sure of doing this, and anything short of complete success results in a skin with wing feathers which are not in their true relative positions. The museum worker using such a specimen may draw erroneous conclusions about wing proportions. It is for this reason that many museums forbid their collectors to strip the ulna of any specimen.

2) *Bill closing.* Many specimens have their value lessened by bills that are improperly closed (and therefore hard to compare with others), bills that have been distorted by being tied shut too tightly, or bills of which the nostrils have been deformed by needle and thread. An exactly closed, unmutilated bill is an essential part of a good specimen.

[1] Part of a Symposium presented at the Buffalo meeting of the A.O.U., October, 1949.

THE BIRD SKIN LABEL.—Many fieldmen are inclined to overlook the great importance of the specimen label. (At Michigan we sometimes tell our students that the label is more important than the specimen.) I cannot do better than to quote the statement which Alden Miller wrote in 1940, in a serial publication which perhaps ornithologists do not commonly see (Museum News, 17 (17): 6): "The original label written when the animal is taken and prepared is a scientific document. It must never be destroyed or replaced and the essential data it is to bear must be entered at the time, not later. The practice of writing temporary labels is pernicious in the extreme." It is important to keep as much of the data as possible *with* the bird. Data *on* the specimen will be far more useful to you and to everyone else than data in your notes, no matter how perfectly these are made and filed.

Every collector knows that the minimum data on a label include: locality, date, name of collector, and sex of specimen. There are other, very desirable, items which I will mention below, but first let us consider some of the necessary points about the minimum data, for even the minimum data can be recorded in most undesirable ways.

1) *Locality.* In all museum work, a shocking waste of time results from labels on which the locality data are not readily understandable. To avoid that, always list the locality thus: state, county, town, and (finally) locality in relation to the town. If the major locality (state, province, or country) appears at the left end of every label (where museum workers expect it) much time is saved. In the United States, counties should always be given. *You* may know just where "Parker's Prairie, Minnesota," "Silo, Oklahoma," or "Pea Ridge, Arkansas," is, but remember that not all museum workers have had your educational advantages. It should not be necessary to add that altitude is an essential part of the locality data in mountainous country.

2) *Date.* The only safe rule is to designate the month by at least a three-letter abbreviation—never by numbers of any kind. As some people do not seem to realize, there are two diametrically opposite ways of writing the date when designating the month by a numeral. Thus "6/12/1949" may mean June 12, 1949, or 6 December 1949. Americans use one method, and the rest of the world uses the other. To make matters worse, the U. S. Army taught the *European* method to several million Americans during World War II. As a result, to read some of these fiendish all-numeral dates, one must not only know where the collector was born but also whether he recently served in the U. S. Army! Let me repeat: *Never* designate the month on a bird label by a numeral of any sort.

3) *Name of collector.* Even this item is sometimes misinterpreted. We are glad enough to know that Indian Joe brought in a given specimen, but we are more interested in knowing who prepared and sexed the specimen and wrote the label. The problem is solved if we add to the standard label: "Prep. by John Doe."

4) *Sex of specimen.* Experienced collectors may think it obvious that a scientific specimen must *always* be sexed by dissection, but museum experience shows that it would be too optimistic to assume that all collectors follow that rule. Every field worker should realize that no one can sex accurately 100 per cent of the specimens collected; shot damage and other factors make an occasional specimen quite impossible to sex with certainty. When a collector sends in a large number of specimens with the sex marked definitely on all, we know that he is either doing some guessing or, contrary to our explicit instructions, is discarding some of his specimens in the field.

The museum worker is sometimes confronted with specimens on which the collector's statement of sex disagrees with the plumage indications. Then, to be safe, the museum man will probably assume that there is an error and leave that specimen out of his calculations, unless there is some indication on the label that the collector realized that his diagnosis was surprising. Such a situation is automatically provided for if the collector follows the practice, standard in some modern museums, of recording the size of the gonads on all specimens. Many collectors follow J. P. Chapin's system and write "t. e." (testes enlarged), "t. n. e." (testes not enlarged), etc.; others record in millimeters the measurements taken with calipers; still others take the measurements in the same way but record them graphically by drawing an actual-size outline of the gonads on the back of the label.

5) *Age determination.* This is a very important matter. Many collectors have long marked the age on labels, but one may easily be led astray unless some additional record on the label shows that the collector was critical in his determination. (One well-known ornithologist of the last generation had the habit of marking "adult" on the label of any specimen which was not obviously a nestling!) Fortunately, some collectors have long followed the practice, proposed by Chapin, of recording by initials the condition of the skull of passerine birds: "s. o." (skull ossified), "s. n. o." (skull not ossified).

6) *Weights.* It is no longer necessary to defend the practice of recording bird weights, but it was not always so in the A.O.U.! When Alfred Gross and I began systematically weighing our specimens in Panama in 1925, we were lampooned more than once in the pages of 'The Auklet' for that ridiculous over-refinement of technique.

Now many articles based on weight data have appeared and other, more interesting, ones await only additional data on certain species. Dozens of uses for weight data have become apparent, and an increasing number of field workers are systematically recording the weights of the specimens they collect. Nevertheless, there are still many who are unwilling to take the trouble to weigh birds in the field. It is to these that this reminder is addressed. Actually, it is very easy to arrange portable sets of scales, and their use while making up birds in the field takes extremely little time.

7) *Colors and physical condition.* The process of recording the perishable colors of the soft parts of birds is indeed a time-consuming and difficult one. However, there is no need to record elaborate color data on every specimen; many of us make such records only on an occasional bird from a locality in which we have not taken a representative of the species before. Secondly, there is little to record in the case of the majority of small passerine birds. We must, of course, watch constantly for exceptions. A few birds that are very much alike as museum specimens prove to be distinguishable in life by their differently colored tarsi or other soft parts (*e.g.*, the Black-poll Warbler and Bay-breasted Warbler in fall).

There is one complication, resulting from the lack of an adequate but inexpensive book of standard colors. Ridgway's "Color Key" was long the accepted standard, and our printed literature is largely based on it. Unfortunately, the permanence of Ridgway's color plates is now seriously questioned and, in any case, the book is no longer available. The younger generation will have to turn to some other standard. The more recent color standards published in the United States (Maerz and Paul, Munsell, etc.) seem to many of us to have serious drawbacks, but fortunately a new color guide just published in Buenos Aires and reviewed in 'The Auk' (67: 114–115, 1950) seems well adapted to our purposes and includes complete tables for conversion from Ridgway's color names.

Other matters which should be recorded on the label are the details of physical condition (*i.e.* degree of fatness, presence of brood patches or other evidences of breeding), readily identifiable stomach contents, and an indication of the habitat.

8) *Hieroglyphics.* Before we leave that 3- by 5/8-inch slip of paper—the bird skin label—I should mention one other matter, that of legibility. Probably more errors arise from our mis-reading carelessly written labels than from any other source. A few extra seconds spent in writing a clear, legible label will be well invested. There is, after all, little use in attaching especially full data to your specimen if they

cannot be read easily or perhaps be read at all. The many items discussed above may seem beyond recording legibly on the two sides of a standard 3- by 5/8-inch museum label, but the fact is that many of us regularly do so. For the occasional bird that is unusually rich in data, we add a second (unprinted) label to carry the extra information.

Further, it may seem that I have placed too much emphasis on minor details of collecting, but unless we do a good job of collecting birds and recording data, all our slide-rule calculations and philosophical conclusions will certainly go astray.

ANALYSIS OF SPECIMENS.—The techniques used in analyzing specimens for taxonomic purposes are too numerous even to outline in this paper; therefore I shall speak only of certain controversial items.

1) *Measurement.* Obviously the measurements published by workers in various parts of the world cannot be compared and used for common purposes unless they are made in the same way or at least in ways that other workers understand. In 1931, Baldwin, Oberholser, and Worley attempted to standardize the methods in "Bird Measurements" (Sci. Publ. Cleveland Mus. Nat. Hist., 2)—an excellent and well illustrated report in spite of the criticism that a large number of the measurements described there are of bird parts not ordinarily used by taxonomists or of structures that are characteristic of only two or three of the nearly nine thousand known species.

The most used measurement—that of the length of the folded wing—is still unstandardized and perhaps will always remain so. Baldwin, Oberholser, and Worley described in full the method of measurement that they preferred, briefly mentioning the other method (which, however, seems to be the one that the majority of the ornithologists of the world now use). They rightly emphasized the importance of specifying the method employed. Unfortunately, they did not attempt to standardize the terminology for describing the two methods. The point is this:

The closed wing of most birds presents a surface which is at least slightly convex. Therefore, when measuring the wing with a straight ruler, one has the choice of measuring the chord of this natural curve or of flattening the wing against the ruler and taking a measurement that will be the equivalent (or nearly the equivalent) of measuring the arc of the naturally curved wing with a flexible rule. Obviously the measurement of the flattened wing will be somewhat greater than that of the wing measured across the chord of the curve, and one ***must*** say which measurement one has taken. Many of us have attempted to label the wing measurements we publish by adding in parentheses the word "chord" when we have measured the chord of the curved wing

and "arc" when we have measured the arc of the curved wing. What could be more simple? We thought the problem solved. But the difficulty is this: When we use the word "arc" we automatically produce in the minds of some readers the picture of a *curved* line, but note that we are using it to indicate that we have measured the *straightened* wing (not the curved wing). The confusion caused by this simple fact was evident even in some of the letters that I received recently from well-known practicing museum ornithologists. Frankly, I am puzzled. Perhaps someone more skilled in exposition can suggest a solution for this absurd but tantalizing little problem.

Another much-used measurement is that of the culmen. There are many ways of measuring the bills of birds, and bills show such extreme variation between species that no single method will suffice for all. However, my associates emphasized two points: First, we must always record what measurement we intend. Secondly (and they were almost unanimous in this), the measurement of the so-called "exposed culmen," popularized and established in the literature by Ridgway, is a very poor one and should be dropped. In practice, it is apparent that the indefinite character of the proximal end of the line being measured makes it impossible to secure uniform results.

2) *Numbering of primaries.* The outer wing feathers, or primaries, of birds form a very precise pattern which is so unvarying in any given species that it is frequently used in taxonomic studies. To enable us to designate particular feathers, we give the primaries serial numbers. Most small birds have 10 primaries, but certain families (such as the pipits) have 9, others (*e.g.*, vireos) vary within the family. Since reduction in the number of primaries is always by loss of the outer primary, it is necessary to number the primaries from the inside outward. Then when the outer primary is lost (as we pass from one family to another), the missing primary is the tenth, the others retain their original numbering, and we can still compare homologous primary feathers in various birds. This method of numbering is very general in America, but some workers, apparently not understanding the reason back of this numbering system, occasionally advocate our using the opposite and (in counting) slightly more convenient method, which, strangely enough, is general among Old World ornithologists.

DESCRIPTION OF NEW KINDS OF BIRDS.—There are at least two recent papers that analyze the degrees of difference to be demanded of proposed new forms (Condor, 51: 250–258, 1949; Auk, 67: 169–183, 1950), and I shall confine myself to touching briefly on two points:

First, I should like to repeat the warning which several of my correspondents expressed against describing forms that are simply

parts of a cline in one character, such as size—unless, indeed, it is a well-marked step cline. Taxonomy has already been unnecessarily complicated by too many descriptions of "intermediates between intermediates."

Secondly, I wish to express my considered opinion that, with possible rare exceptions, we should no longer give new names to single specimens. Perhaps some of you think of that practice as characteristic of the last generation, but I remind you that only this summer one of us (a curator in one of the big ornithological research departments) described as new a single, doubtfully sexed, immature specimen of a rare bird taken more than a thousand miles outside of the known range of the species. Surely such a paper does not constitute proof of the existence of an undescribed subspecies; it is only a suggestion—a wager—that a new form will probably be found there by some future worker, on whom will fall the real burden of proving the existence of the subspecies and describing its characteristics.

PREPARATION OF THE PAPER FOR PUBLICATION.—Finally—about the publication of the scientific results—let me mention one or two points which, my associates remind me, need attention:

The best taxonomic paper will be expressed in clear, simple English and will contain few or no superlatives. If you are describing a new form, your cynical colleagues will only be the more sceptical if you tell them that the new form is "strikingly" or "outstandingly" different, or that your specimens are (as someone recently put it) "ultra-typical." Let them have the measurable differences, and they will decide for themselves whether the new form is "startlingly" different or, perhaps, just recognizable.

The well-written paper will include references to all of the papers you have found useful in your investigation, and the references will be sufficiently full to obviate any necessity for bibliographic research before your reader can find and use them. Please remember that almost no one who follows you and uses your work will—when he begins—have the literature in mind as you then do.

IN CLOSING, let me say that the techniques of field collecting and taxonomic work in America have unquestionably reached a degree of excellence never before attained, but there remain some very uneven spots, and I sincerely hope that this discussion may contribute to further improvement in the quality of our work.

Museum of Zoology, University of Michigan, Ann Arbor, December 8, 1950.

A TRANS-GULF MIGRATION

BY HARVEY R. BULLIS, JR., AND FREDERICK C. LINCOLN

AMONG the many fields of ornithological activity, it is probable that no other commands as much popular interest as migration. Calendars of bird students the world over are attuned to the rhythmic movements of the migratory birds. Although the most astute of those students readily admit the great gaps in our knowledge of the subject, some beliefs have become so firmly rooted that to question their validity amounts almost to heresy. The concept of trans-Gulf migration is so rooted among North American students of bird migration.

The idea that the routes between summer and winter quarters of great numbers of North American migrants—particularly of the small "song bird" group—included the long over-water hop across the Gulf of Mexico apparently was first enunciated by the late Wells W. Cooke (1904) and ten years later (1915) was restated by him in somewhat greater detail. Subsequent students, including the junior author of the present paper (1935, 1939, 1950), have generally accepted this dictum as a foundation stone of the subject. Accordingly, it was a shock to complacency when Williams (1945) wrote his challenge to this concept. In a masterly manner, he presented much hitherto-unpublished and thought-provoking data. The gauntlet was promptly picked up by Lowery, who with a corps of collaborators published an investigation that was long overdue. His detailed report (1946) added greatly to our knowledge of the subject and served to reestablish the belief that great numbers of North American migrants not only can but regularly do cross the Gulf of Mexico.

It is not the purpose of the present authors to review the entire subject. Space will not permit such a summary, but we are listing the important references, chiefly those of Williams and Lowery. Our objective here is to place on record some observations by the senior author that we believe will further support the principle of trans-Gulf migration.

On the nights of April 6 and 7, 1951, the Fish and Wildlife Service exploratory boat, *M/V OREGON*, was trawling in an area in the Gulf of Mexico approximately 60 miles off the Louisiana coast. Its position was Lat. 28° 10′ N., Long. 91° 06′ W. This placed it well west of the delta of the Mississippi River and on a line a little west of Baton Rouge. The weather conditions were characterized by a slowly falling barometer, a low overcast, and wind of widely fluctuating velocity shifting from southerly on April 6 to northerly early in the

morning of the 7th. Table 1 presents the weather data as recorded in the captain's log and the bridge log of the *OREGON*.

The lighting on the afterdeck of the *OREGON* is provided by three 500-watt bulbs, two on the mast about 35 feet above the deck and the other on the tip of the boom, which in its raised position puts the light about 40 feet above the deck near the stern of the vessel. The entire afterdeck is therefore flooded by brilliant white light. A 150-watt spotlight is installed above the pilot house.

TABLE 1

WEATHER CONDITIONS PRECEDING, DURING, AND FOLLOWING THE MIGRATORY MOVEMENT. (TAKEN FROM THE BRIDGE LOG AND CAPTAIN'S LOG OF THE *M/V OREGON*)

Date	*Hour*	*Wind (in miles per hour)*	*Barometer*	*Temperature*	*Sky condition*
April 5	8:00 p.m.	SSE 30–35	30:00		Overcast
April 6	9:10 a.m.	S 10–12	29:90	69°	Overcast
April 6	4:00 p.m.	SE 8–10	29:80		Overcast
April 6	6:00 p.m.		29:82		Overcast
April 6	7:00 p.m.	E 6–10	29:81		Overcast
April 6	8:00 p.m.	S 6–8			Overcast
April 7	12:00 m.	SE 8–12			Overcast
April 7	2:00 a.m.	N 15–20	29:80	67°	Overcast
April 7	8:00 a.m.	NE 6–8			Overcast
April 7	10:00 a.m.	N 25	29:79		Partly cloudy
April 7	4:00 p.m.	NW 30–35			Partly cloudy
April 7	5:00 p.m.	NW 25–30	29:80	65°	Overcast
April 7	6:00 p.m.	NW 18	29:82		Cloudy
April 7	8:00 p.m.	NW 10–15			
April 7	10:00 p.m.	NW 20	29:82		
April 8	8:00 a.m.	N 6–12	29:96	61°	Clear

Late in the afternoon of April 6 a Broad-winged Hawk, *Buteo platypterus*, circled the boat and flew off to the west. Shortly before dark a few unidentified warblers landed on the boat's rigging. The direction of their approach was not noticed, but after resting a few minutes they flew off to the north, flying low over the water.

About 9 p. m. hundreds of small birds, for the most part warblers, were noticed flying around the lights of the boat. Occasionally one would strike the rigging and fall to the deck or into the water. All that could be reached were retrieved with a dip net. By 10 p. m. many larger birds were seen interspersed with the smaller forms. This mass movement continued until shortly before daylight. Above the din caused by the continuous peeps of the smaller birds, the quack of ducks was heard between 10 and 10:30 p. m. The searchlight was employed in an attempt to locate them, but they were not seen. The light, however, picked out thousands of birds, large and small, that were flying under the overcast. Most of the birds seemed to be flying within 200 feet of the water. Owing to the surging of the vessel and

the criss-cross movement of the birds, it was difficult to obtain a true bearing on the direction of flight, but the whole movement was in a north-northwesterly direction. If the flight followed that course from its origin, it seems certain that the last contact with land was along the northeast coast of the Yucatán Peninsula.

TABLE 2

LIST OF SPECIES RECORDED FROM *M/V OREGON* DURING THE NIGHT OF APRIL 6, 1951

*Common Gallinule, *Gallinula chloropus* (1)
Common Nighthawk, *Chordeiles minor*
*Olive-sided Flycatcher, *Nuttallornis borealis* (1)
*Vermilion Flycatcher, *Pyrocephalus rubinus*
Tree Swallow, *Iridoprocne bicolor*
*Purple Martin, *Progne subis* (2)
*Black and White Warbler, *Mniotilta varia* (3)
*Prothonotary Warbler, *Protonotaria citrea* (1)
*Worm-eating Warbler, *Helmitheros vermivorus* (2)
Nashville Warbler, *Vermivora ruficapilla*
Yellow Warbler, *Dendroica petechia*
*Magnolia Warbler, *Dendroica magnolia* (2)
*Yellow-throated Warbler, *Dendroica dominica* (2)
*Black-polled Warbler, *Dendroica striata* (1)
*Kentucky Warbler, *Oporornis formosus* (9)
*Yellow-throat, *Geothlypis trichas* (6)
Hooded Warbler, *Wilsonia citrina*
Redstart, *Setophaga ruticilla*
*Orchard Oriole, *Icterus spurius* (1 im. ♀)
Scarlet Tanager, *Piranga olivacea*
Summer Tanager, *Piranga rubra*

* Specimens of those species marked by an asterisk were retrieved from the water by means of a dip net; the figure following in parenthesis is the number so recovered.

Most of the identifications were made from the crow's-nest on the *OREGON*. At that altitude, the stream of birds was so thick that they were flying into the mast and rigging and striking the observer (Bullis) at the rate of three or four every minute. Hundreds fell into the water beyond the reach of the dip net. Under the prevailing conditions, unquestionable identification of birds in the air was almost impossible. Nevertheless, confirmation of many visual determinations was furnished by the 33 birds that were retrieved (Table 2). In fact, among those recovered by means of the dip net there were six species not recorded in the visual observations.

In addition to the species named in the table, tentative identifications were made of the Mourning Dove, *Zenaidura macroura*, and the Yellow-throated Vireo, *Vireo flavifrons*, and some other species of swallows. It is believed that in the flocks of passing birds there may have been 25 or more additional species that could not be definitely recognized. The variety and the density of the flight made an unforgettable impression. Because of the rarity of the Vermilion Fly-

catcher in Louisiana, the single observation of this species was easily the prize record. There was no error in its identification, however, as both it and the Summer Tanager were seen under the white deck lights, and in both cases the brilliant reds brought forth comments from the entire crew.

The width of this flight is, of course, a matter of conjecture, but it is believed that tens of thousands of birds passed the *OREGON* on the night of April 6. The flight was so dense that it is difficult to see how an application of the technique described by Lowery (1951) in his lunar studies of bird migration could have been applied.

Just before daylight on April 7, a Roseate Spoonbill, *Ajaia ajaja*, landed on the bridge of the vessel. It was captured and later turned over to the Louisiana Department of Wildlife and Fisheries. On that night, the *OREGON* was under way on an east-northeast course in the approximate vicinity of Lat. 28° 35′ N., Long. 90° 00′ W. Heavy seas prevented the usual fishing operations, so all deck lights were extinguished and only running lights were on. The following morning the wheel watch reported "a large number of birds flying over the boat." No identifications were made nor was the direction of flight recorded.

In the opinion of the authors the observations recorded here provide definite evidence of a heavy trans-Gulf migration between the Yucatán Peninsula and the coast of Louisiana. Since, however, the statement has been made that the presence of large numbers of land birds south of the Louisiana coast may be the result of heavy off-shore winds ("northers"), we have thought it well to obtain from the Weather Bureau the pertinent meteorological data. Through the courtesy of the Washington headquarters, the April records have been obtained for the stations at Pensacola, Florida, New Orleans, Louisiana, and Galveston and Port Arthur, Texas. The daily weather maps for the period April 3–7, inclusive, also have been studied.

On April 3, a high-pressure area was centered over eastern Texas. By April 4 this had moved southeasterly into the northern part of the Gulf of Mexico where it moved eastward. On April 5 it was centered south of the Florida panhandle with a long trough extending northwest to the upper Mississippi Valley. At the same time a low-pressure area had developed over northcentral Mexico, with another over western New Mexico and southeastern Colorado, resulting in a relatively small area of light precipitation in Colorado, Kansas, western Oklahoma, and northern Texas. By April 6 the high had crossed the Florida peninsula and was centered over the Bahamas, while the two lows had joined. The area of precipitation had spread east to the Mississippi Valley and thence south to the Gulf Coast. In the latter

area the amount was very small, being only a trace at some stations. The wind and cloud conditions during this period at the four Gulf-Coast stations are shown in Table 3.

An examination of the data in this table shows that, except for the overcast with light rain that developed along the Texas coast on April

TABLE 3

METEOROLOGICAL CONDITIONS ALONG THE GULF COAST OF THE UNITED STATES APRIL 3–6, 1951

	Wind			
1951	*Direction*	*Average miles per hour*	*Fastest miles per hour*	*Percent possible sunshine*
Pensacola, Florida				
April 3	N	8.9	17	68
April 4	W	6.9	14	100
April 5	SE	6.9	13	87
April 6	SE	15.0	24	0
New Orleans, Louisiana				
April 3	N	7.7	13	68
April 4	NE	4.9	9	100
April 5	SE	8.7	15	38
April 6	SE	8.3	14	0
Port Arthur, Texas				
April 3	N	9.2	17	78
April 4	S	11.0	21	100
April 5	S	17.2	29	0
April 6	S	7.4	17	1
Galveston, Texas				
April 3	NE	8.6	13	67
April 4	SE	13.3	22	100
April 5	SE	15.3	26	0
April 6	SE	7.8	22	2

5 and moved eastward to Louisiana and Florida on April 6, the general climatic conditions were not unusual. Winds were moderate and, for most of the period, from directions that would best serve the migrating birds.

The evidence seems to indicate clearly a heavy trans-Gulf migration of many species of birds which came under observation through the fortuitous location of a brilliantly lighted vessel in the path of travel at a time when an overcast was causing the birds to fly at low altitudes.

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THE AIR SACS OF THE LOON

BY H. T. GIER

At irregular intervals during the past 100 years, there have been reports on the methods of study, general structure, modifications, and functions of the avian respiratory system. Most of the work has been done with the Pigeon, *Columbia livia* (Muller, 1908; Gilbert, 1939) and the Chicken, *Gallus gallus* (Locy and Larsell, 1916; McLeod and Wagers, 1939). These and other references in the literature serve merely as an introduction to the study of functions and variations in structure of avian respiratory systems.

The state of knowledge as to the extent and positions of the air sacs of the Pigeon and the Chicken and the various terminologies used are well-covered by the references listed above, and will not be reviewed.

This report is the first of a series being prepared in an effort to augment and clarify our store of knowledge on the morphology of air sacs so that an overall comparative picture is possible. This work was started under the direction of the late Dr. Will Scott at Indiana University in 1935, was continued at Ohio University from 1938 to 1946, and has been resumed at Kansas State College. After preliminary dissections of specimens from most of the orders of North American birds, the Common Loon, *Gavia immer*, was selected as having the simplest set of air sacs, and for that reason is being used as the type with which other birds will be compared later. Much of the dissection and detailed description recorded here was done by Phyllis Ruhland under supervision of the author.

Materials and Methods

The walls of the air sacs are so thin that, in most birds, as soon as the body cavity is opened the sacs collapse, making their extent and connections extremely difficult to determine. In order to overcome this difficulty, some material which will solidify later is injected into the respiratory system through the trachea. Muller (1908) used paraffin or gelatin, and Gilbert (1939) used Wood's metal for injection.

In this study, three Loons were used. Gelatin was injected into the respiratory system of one bird, and paraffin (melting point 45° C.) was used in the other two. Gelatin filled well but became brittle and crumbly in formalin and thus proved to be unsatisfactory.

For injection with a heat-liquified medium, such as paraffin, the body of the bird must be maintained at a temperature slightly above the solidification point of the medium to insure filling of the smaller

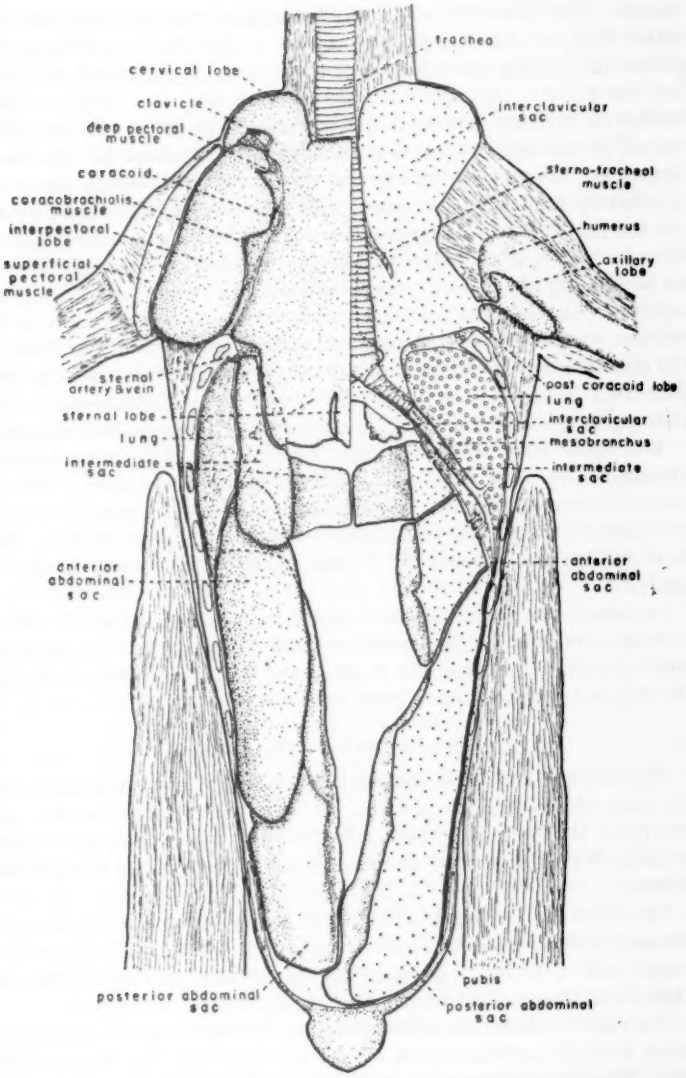

FIGURE 1. Ventral view of respiratory system of Common Loon with body wall removed. The ventral half of left side of respiratory system was removed as shown in Figure 3, B. (⅔ nat. size.)

spaces. This was done effectively by keeping the bird immersed in a water bath of the desired temperature. The injection was accomplished by forcing the injection mass, from a pressure flask held in a hot-water bath, through a canula inserted into the trachea. Controlled air pressure was supplied by a small air pump. An automatic cut-off in the line, adjusted to three pounds pressure for the Loon, prevented over-distention of the sacs. Air was forced from the respiratory system by alternately filling it with paraffin and squeezing out the paraffin-air mixture until no more air bubbles could be expelled. Usually four or five fillings, with proper turning of the bird while the air was being forced out, proved sufficient to remove all air. When injection was considered adequate, the canula was removed from the trachea, excess injection medium allowed to escape under pressure of the normal elasticity of the bird's body, the trachea tied, and the body immersed in formalin or phenol solution until the tissues were fixed thoroughly or, if already fixed, until the injection mass had solidified.

The birds were skinned either before injection or after fixation. Detailed dissections were made to determine the locations of the air sacs and their diverticula in relation especially to the muscles, nerves, and skeletal units. Howell's (1937) terminology was followed. For relationships not covered by Howell, Kaupp (1918) was used as a guide.

Drawings were made life size from a specimen injected with paraffin. Some details were omitted for the sake of clarity. The body wall and skeletal units are shown only to give relationships; viscera other than the respiratory structures were omitted.

THE INTERCLAVICULAR SAC

The interclavicular sac (anterior thoracic of Locy and Larsell, and McLeod and Wagers) is a large, unpaired sac located anterior and ventral to the heart and lungs. In the Loon it fills the position that is occupied by the cervical and interclavicular sacs of the Chicken and Pigeon.

The main part of the interclavicular sac lies posterior to the clavicles and dorsal to the coracoid and sternum. It extends around the cranial end of the heart, dorsally around the bases of the bronchi, and laterally to the cranial tip of the lung.

The paired subclavian, subscapular, and sternal arteries, the sternal veins, and the accompanying nerves pass through the cavity of the sac. The innominate and carotid arteries and the innominate, jugular, and subclavian veins protrude into the wall of the sac, but are not completely surrounded by the air space. Penetration of the

air sac by nerves and blood vessels was accomplished embryonically by expansion of the sac around the obstruction, and subsequent fusion and disappearance of walls that became appressed (Gier, unpubl. data).

The posterior half of the part of the trachea within the sac is attached to the esophagus by a fold of mesentery, in the anterior end of which are located the paired tracheal arteries and veins. Anterior to these blood vessels, the trachea is completely surrounded by the interclavicular sac. The sterno-tracheal muscle extends through the sac, cranio-medially, from its origin on the lateral tip of the sternum to its insertion on the side of the trachea at the level of the tracheal arteries and the anterior connection of the tracheo-esophageal mesentery.

The interclavicular sac connects to both lungs through one or two tubes on each side located medio-dorsal to the bronchus and the pulmonary vein. These tubes break up into parabronchi before they enter the mesobronchi. In one specimen, a second connection was found, ventral to the bronchus, from the lateral margin of the sac to the medio-ventral edge of the lung.

Diverticula of the interclavicular sac.—The interclavicular sac in the Loon has six secondary lobes or diverticula: cervical, sternal, postcoracoid, subscapular, axillary, and interpectoral. The humerus is not hollow and, therefore, no humeral diverticulum exists in the Loon.

The cervical lobes of the interclavicular sac lie anterior to the clavicles, fill the space between the clavicles and the neck, and are separated medially by the trachea and esophagus. They are limited dorso-laterally by the anterior tip of the scapula and the anterior portions of the rhomboid muscles. Whether these "cervical lobes" have any homologies with the cervical sacs is doubtful. This point can be cleared only by an extensive comparative study or by study of the embryonic development.

The sternal diverticulum is a broad, triangular, posterior projection of the interclavicular sac between the heart and the sternum and extends laterally almost to the margin of the sternum. In two specimens there were a median and two lateral divisions of the posterior tip, as shown in Figures 1–3. In the third specimen, the posterior margin was serrate but not divided.

The postcoracoid diverticulum appears in the Loon only as a slight ridge-like protrusion from the interclavicular sac between the coracoid and the first rib.

The subscapular diverticulum is a caudal extension from the cervical lobe of the interclavicular sac and is secondarily connected medio-ventrally to the dorsal end of the postcoracoid diverticulum (Fig. 1).

It is limited from the main sac both antero-dorsally and postero-ventrally by a slight infolding of the wall, caused by the projection into the sac of the nerves and blood vessels which supply the pectoral girdle. The subscapular diverticulum lies medial to the anterior one-fourth of the scapula.

The axillary diverticulum is connected by a thin tube to the lateral surface of the postcoracoid diverticulum. It is located in the angle between the scapula and humerus.

The interpectoral diverticulum arises from the postcoracoid diverticulum and is separated from the more dorsal connection of the axillary diverticulum by the coracobrachialis muscle. The interpectoral diverticulum lies in the angle between the humerus and the coracoid and extends ventro-medially between the superficial and deep pectoral (supracoracoid) muscles. It is divided into two broadly-joined lobes by the projection into its posterior wall of the large nerve, artery, and vein which attend the superficial pectoral muscle. The interpectoral and axillary lobes are separated partially by the biceps muscle and the insertion of the scapulohumeralis muscle. Ventro-laterally, the interpectoral diverticulum is covered by the superficial pectoral muscle. The axillary and interpectoral diverticula form a cushion around three sides of the head of the humerus.

The Intermediate Sacs

The intermediate sacs (anterior intermediate of Locy and Larsell; posterior thoracic of McLeod and Wagers) are paired, almost symmetrical, and located medio-ventral to the lungs and lateral to the heart, proventriculus, and liver (Figs. 1–3). The anterior margin is in contact with the lateral margin of the sternal lobe, and the posterior portion lies ventro-lateral to the anterior end of the anterior abdominal sac. The ventral wall is limited by the ribs and intercostal muscles. A medial projection of each sac extends dorsally around the proventriculus where the membranes are contiguous along the mid-dorsal line. The sacs are separated from the lungs by the pulmonary diaphragm. Ventral to the lung, part of the outer wall of the sac is fused with the parietal peritoneum.

Two or three ostia pierce the pulmonary diaphragm and enter the lung from each intermediate sac. One is located dorsal and posterior to the point of exit of the pulmonary vein from the lung. The other ostia are located near the medial tip of the lung, ventral to the bronchus and pulmonary vein. Location of these ostia varies individually.

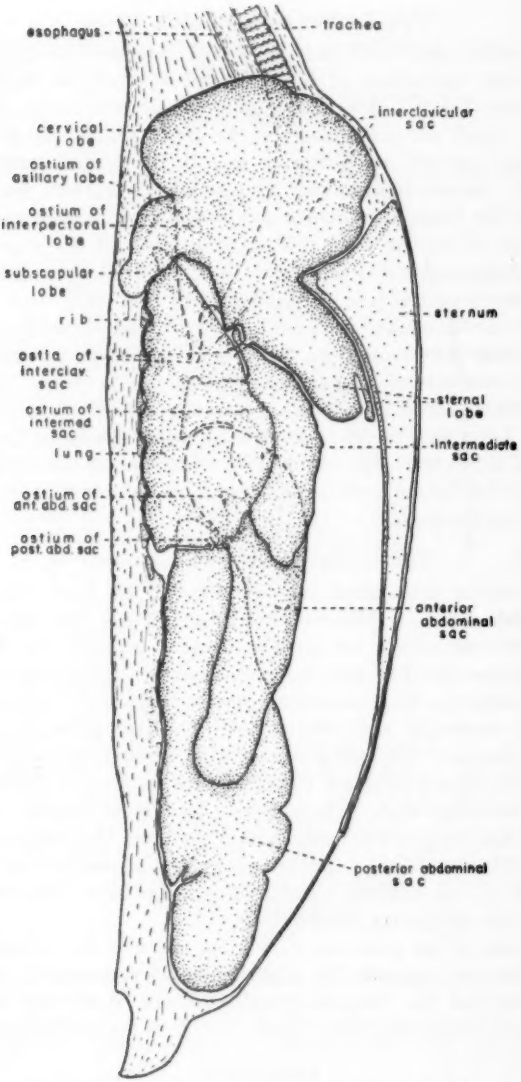

FIGURE 2. Respiratory system of Common Loon from left side. The body wall was removed by sagittal cut along left margin of carina and to left of vertebral column. Diverticula of interclavicular sac are omitted. The most lateral sacs are drawn as if transparent to show outlines of deeper sacs. (⅗ nat. size.)

THE ANTERIOR ABDOMINAL SACS

The anterior abdominal sacs (posterior intermediate of Locy and Larsell; lesser abdominal of McLeod and Wagers) are large, asymmetrical sacs, located along the ventro-lateral abdominal wall (Figs. 1 and 2). Each sac extends anteriorly to the cranial tip of the liver and presses against the posterior margin of the intermediate sac. Posteriorly, the sac reaches slightly beyond the last rib; dorsally it is limited by the pulmonary diaphragm and posterior abdominal air sac, ventro-laterally by the body wall, and medially by the viscera. The anterior abdominal sac is separated from the posterior abdominal sac by the parietal peritoneum covering of both sacs.

Three separate ostia from each sac were noted in one Loon. Two small openings were located on the postero-ventral margin of the lung, and a large one was slightly anterior and medial to these. Numerous parabronchi extended from the lung into the wall of this larger ostium. A second Loon was found to have only two ostia from the anterior abdominal sac to the lung—the smaller, marginal ostium being absent. All ostia pierce the muscular pulmonary diaphragm which lies between the lung and the air sac.

THE POSTERIOR ABDOMINAL SACS

The posterior abdominal sacs (abdominal of Locy and Larsell; greater abdominal of McLeod and Wagers) are the largest, most asymmetrical air sacs in the Loon and extend from the tip of the lung to the posterior limit of the abdominal cavity (Figs. 1 and 2). Dorsally and laterally, they are limited by the body wall with which they are fused; ventrally and medially, they adjust their shape to the digestive viscera. The left abdominal, which was observed to be the larger of the two sacs in the three Loons examined, is much broader posterior to the gizzard. The enlarged portion of this sac crosses the midline of the body and extends around the tip of the smaller and more uniform right abdominal. These sacs have no diverticula in the Loon. Variations of the general contour of the posterior abdominal sacs were found in all specimens examined.

Connection of the posterior abdominal sac with the posterior tip of the lung occurs regularly by a single broad tube which is a direct continuation of the mesobronchus. In one specimen, a second, smaller connection was found lying parallel to the regular connection.

DISCUSSION

No injection material which is entirely satisfactory has been used thus far in the study of air sacs. Paraffin, which must be heated before injection, is apt to solidify before all the sacs are filled. Any

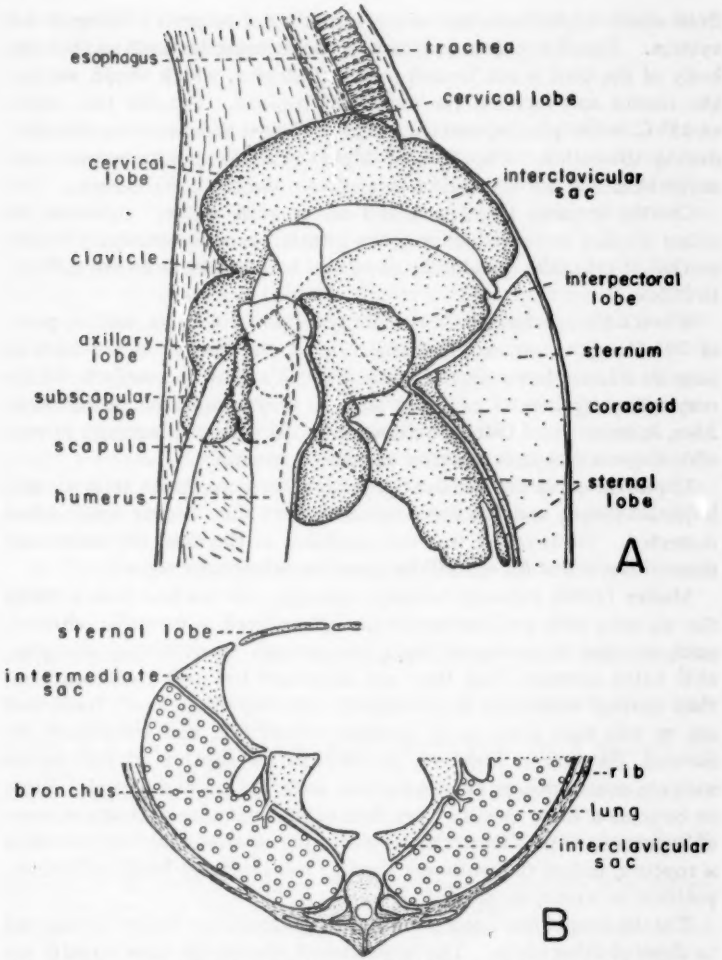

FIGURE 3. *A*. Lateral view of pectoral region of Common Loon to show relationships of interclavicular diverticula and pectoral girdle. *B*. Transverse section through body of Loon, at level of guide line for "interclavicular sac" on Figure 1, to show the dissection made to obtain the view represented in that drawing. (Both ⅔ nat. size.)

fluid which might be in the sacs is a hindrance to proper filling of the system. Paraffin with a low melting point must be used so that the body of the bird is not heated to a high degree, which would weaken the tissues and increase the danger of rupture. Paraffin that melts at 45° C. is too pliable, and the shape of the air sacs becomes distorted during dissection. Paraffins of higher melting points require too much heat and are too brittle to maintain slender connections.

Gelatin requires little heat and mixes with water. However, in either alcohol or formaldehyde, the gelatin becomes extremely brittle so that it crumbles within the sacs, and interconnections are difficult to follow.

Wood's alloy, which has a specific gravity of 9.5 and a melting point of 70° C., gives an excellent injection of the lungs. For a bird as large as a Loon, however, the mass of Wood's alloy necessary to fill the respiratory system is so great that it would rupture the air sacs. Also, it seems from Gilbert's discussion (1939) that it is nearly impossible to get a complete injection in a single specimen.

Liquid latex is an excellent injection medium, since it is elastic, holds its shape, and fills connections so that they do not break when dissected. However, it was not available at the time this work was done. Details of its use will be given in subsequent reports.

Muller (1908) injected formalin through the trachea before filling the air sacs with an injection mass. Sacs fixed in formalin, chromic acid, or other fixatives are toughened enough to withstand considerable extra pressure, but they are shrunken by such treatment and thus normal distention is prevented. On the other hand, fresh sacs are so soft that there is no question about full, and sometimes abnormal, distention; however, possibilities of rupture of free-walled sacs are much greater than when the walls are properly fixed. Birds as large as a Loon usually have firm enough air sacs that any reasonable pressure (up to four or five pounds per square inch) will not cause a rupture, unless the walls are already weakened by bacterial decomposition or excessive heat.

The air sacs of the Loon are simple and smooth in outline, compared to those of other birds. The large smooth diverticula have no intricate connections or delicate tubes such as have been found in most of the orders of birds. Ostia connecting the air sacs with the lung of the Loon are in approximately the same position as those described in the Pigeon by Muller (1908). Muller, however, does not point out variations of the locations of the ostia, which are noticeable in the three Loons examined. Absence of the cervical air sacs, of pneumatized bones, and of small secondary diverticula in the Loon constitutes

the essential difference between the air sacs of the Loon and those of most of the other orders of birds that have been examined.

SUMMARY

Air sacs of several orders of birds have been studied. The Common Loon was selected as showing the simplest set of air sacs. Specimens were prepared by injection of the respiratory system with paraffin, followed by fixation in formalin. The animals were dissected to establish relationships of air sacs to other structures.

The air sacs of the Loon consist of an unpaired interclavicular sac anterior to the lungs and the paired intermediate, anterior abdominal, and posterior abdominal sacs posterior to the pulmonary diaphragm. The interclavicular air sac occupies much of the space anterior to the heart. It has five pairs of diverticula, namely the cervical, sternal, subscapular, axillary, and interpectoral. The intermediate sacs are almost symmetrical, are located medio-ventral to the lungs, and nearly surround the heart. The large asymmetrical anterior abdominal sacs are ventro-lateral to the liver. The posterior abdominal sacs are the largest and most asymmetrical and are dorso-lateral to the abdominal viscera.

In the Common Loon there is no penetration of any bone by any air sac.

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MOLTING OF NORTHERN YELLOW-THROAT IN SOUTHERN MICHIGAN

BY ROBERT E. STEWART

DURING the summer of 1938, detailed studies were made of the molts of the Northern Yellow-throat, *Geothlypis trichas brachidactyla*, in southern Michigan. Observations of the post-natal molt were made each day on nestlings found near Geddes Pond, one mile east of Ann Arbor. Studies of the post-juvenal and post-nuptial molts were from fresh specimens collected at Portage Lake in Jackson County.

NATAL DOWN

The neossoptiles or down feathers are usually found in five different regions or tracts on the newly-hatched Yellow-throat. In the following table, these tracts are listed together with the length of each, as well as the approximate length of the downs or neossoptiles composing each tract. Measurements were taken from one newly-hatched nestling.

Tract	*Length of tract*	*Length of downs*
Coronal	4.0 mm.	5.0 mm.
Occipital	5.2 mm.	3.6 mm.
Spinal	5.5 mm.	7.5 mm.
Humeral	3.0 mm.	8.0 mm.
Femoral	2.5 mm.	5.0 mm.

Figure 1 shows the approximate location of these down tracts. While this figure presents the usual arrangement of the neossoptiles, variations do occur. On July 4, one of the nests studied contained one newly-hatched young and three eggs. This young bird was peculiar in that there were no neossoptiles in the femoral tracts. Unfortunately, the nest had been destroyed before my visit on the following day so that I was unable to find out if this peculiarity held true with the other occupants of the nest. While visiting another nest on July 7, which contained three newly-hatched young, I found that neossoptiles were adhering to the barely protruding tips of some of the tertiaries of two of the young birds. These feathers are present for only a short time, since they are pushed out by the underlying juvenal feathers.

POST-NATAL MOLT

The following description of the post-natal molt is derived from observations of five nestlings (from two nests) made at the end of each succeeding day.

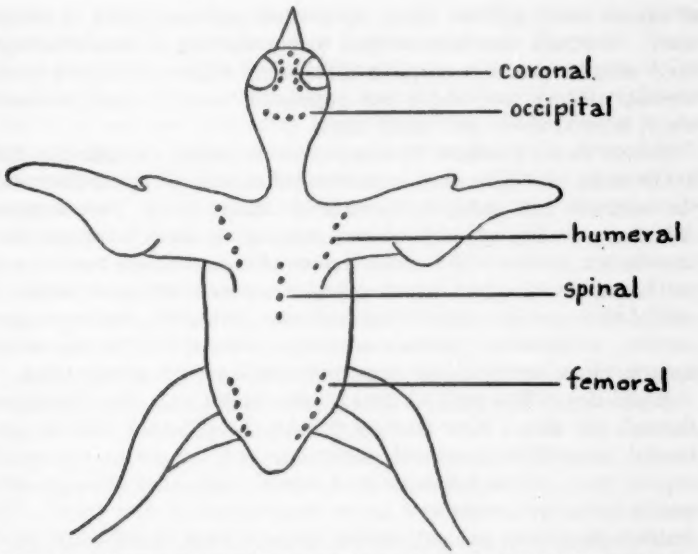


FIGURE 1. Diagram of areas of neossoptiles on the newly-hatched Yellow-throat.

First day.—Natal down present, as described previously. The first two or three primaries are the only feathers of the juvenal plumage that extend through the skin, although many others are visible.

Second day.—All of the primaries have protruded through the skin and the other feathers show up prominently beneath the skin. The ventral tract appears yellow in color and all the others bluish-gray.

Third day.—The feathers of the following areas have just pushed through the skin: humeral tract, and the greater primary coverts, secondaries, and greater secondary coverts of the alar tract.

Fourth day.—Feathers have newly protruded through the skin in the following regions: interscapular, cervical and dorsal regions of the spinal tract; axillary, sternal and abdominal regions of ventral tract; alula and middle secondary coverts; and the femoral tract.

Fifth day.—The feathers in these tracts have just thrust through the skin: coronal and auricular regions of capital tract; pelvic region of spinal tract; cervical region of ventral tract; crural tract; and the marginal coverts, alula coverts, carpalmetacarpal coverts and middle primary coverts of the alar tract. All feathers are ensheathed.

Sixth day.—The feathers in the following regions are now through the skin: frontal, superciliary, occipital, malar and sub-malar regions

of capital tract; and the upper tail-coverts and anal circlet of caudal tract. Feathers that have broken or are starting to break through their sheaths are: interscapular and dorsal regions of spinal tract; sternal, axillary and abdominal regions of ventral tract; humeral tract; femoral tract; and crural tract.

Seventh day.—Feathers that have now extended through the skin are those in: post-auricular and interramal regions of capital tract; and the rectrices and under tail-coverts of caudal tract. New feathers that have broken through or are starting to break through their sheaths are: occipital and malar regions of capital tract; cervical and pelvic regions of spinal tract; upper tail-coverts and anal circlet of caudal tract; cervical region of ventral tract; primaries, greater primary coverts, secondaries, greater secondary coverts, middle secondary coverts, alula, marginal and carpometacarpal coverts of alar tract.

Eighth day.—The loral feathers of the capital tract have protruded through the skin. New feathers broken through their sheaths are: frontal, superciliary, coronal, auricular, and sub-malar regions of capital tract; under tail-coverts of caudal tract; and alula coverts, middle primary coverts and under wing-coverts of alar tract. The feathers that have not yet broken through their sheaths are: loral, post-auricular and interramal regions of capital tract, and the rectrices.

POST-JUVENAL MOLT

In the preparation of an outline of this molt, the plumages of 18 immature birds, representing various stages of the molt, were carefully studied. These birds were collected between August 9 and August 29.

Two of the birds examined gave evidence of just finishing the post-natal molt and at the same time of starting the post-juvenal molt. In these birds, the rectrices, almost certainly juvenal, were partly ensheathed and had not attained their full length, while new feathers of the first-year plumage were found in the interscapular and dorsal regions of the spinal tract, in the humeral and femoral tracts, and in the sternal and axillary regions of the ventral tract. As the rectrices are the last feathers to appear in the post-natal molt, and since the other regions in which new feathers were found are among the first to start molting in the post-juvenal molt, the inference that the two molts have overlapped appears correct. Apparently, the juvenal plumage of some individuals is of very short duration.

The post-juvenal molt of the Yellow-throat has previously been described by Dwight ('The sequence of plumages and moults of the Passerine birds of New York.' Annals N. Y. Acad. Sci., 13 (1): 73–360, 1900), by Chapman ('The Warblers of North America.' D.

Appleton and Company, New York, 1907), and by Forbush ('Birds of Massachusetts and other New England States.' Norwood Press, Norwood, Mass., 1929) as including only the contour feathers of the body and the coverts of the wings, and not the remiges or rectrices. This is at variance with what I have found, as will be shown in the following pages. Of the 18 immature birds studied, eight showed both the remiges and rectrices in some stage of molt, while the plumages of the remaining 10 birds represented earlier stages of post-juvenal molt.

The order of molt of the regions within the capital, spinal, caudal, ventral, and alar tracts is shown in Table 1. The molting sequence as indicated actually represents only the start of the molts of the various regions as the periods of molt in many cases overlap greatly. Procedure of molt within certain areas is described as follows:

Capital tract: Group No. 1 (Table 1) was divided into two sub-groups (a) and (b) because it was found that in some individuals the submalar and interramal regions started to molt before the frontal, coronal and occipital regions, while in others all of these regions seemed to start molting at about the same time.

Spinal tract: The procedure of molt was found to be variable for each region, and the molt of each is extended over a considerable period.

Anal circlet: The molt usually started with the anterior feathers.

Under tail-coverts: The single pair of feathers lying medially and just anterior to the row of under tail-coverts lags well behind the rest in molting. Within the row, the central feathers precede the outer in the order of molt.

Upper tail-coverts: The procedure was variable in different individuals.

Rectrices: In most of the specimens examined, all the rectrices appeared to have molted at about the same time. All the new feathers were nearly the same length; the outer feathers being slightly shorter than the central ones, as they are in the adult. However, in two cases the order of molt was found to be very irregular, new feathers of all sizes in singles or pairs alternating with the older, fully formed juvenal feathers which had not been shed.

Humeral tract: The molt starts at anterior and proceeds posteriorly.

Femoral tract: The medial rows of feathers precede the distal rows.

Crural tract: The feathers are shed two or three at a time, the molt of the entire tract extending over a considerable period.

Ventral tract: The procedure of molt within each separate region is more or less irregular and the period of molt for each region is extended over a considerable length of time.

Alar tract: The molt of the regions of the alar tract as indicated in

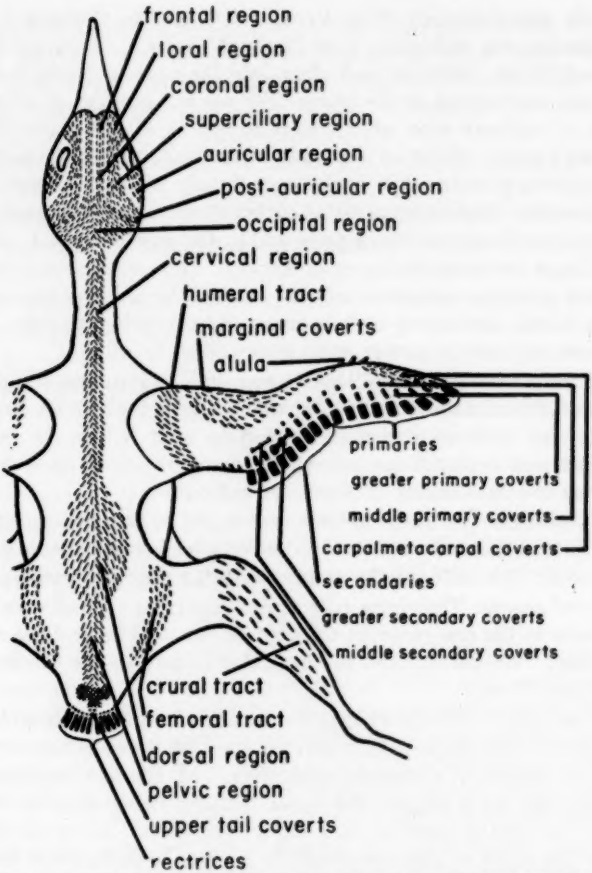


FIGURE 2. Dorsal view of feather tracts and regions on the Yellow-throat.

Table 1 probably represents the usual order of molt, but it is not infallible. These regions seem to vary somewhat more than the other feather tracts in their usual molting sequence. However, this variation was never found to be pronounced and, in all cases where it was observed, only the smaller wing-coverts were involved.

Middle secondary coverts: The molt starts at the proximal portion and proceeds distally in an even, rapid succession.

Greater secondary coverts: The molt starts at the distal portion and

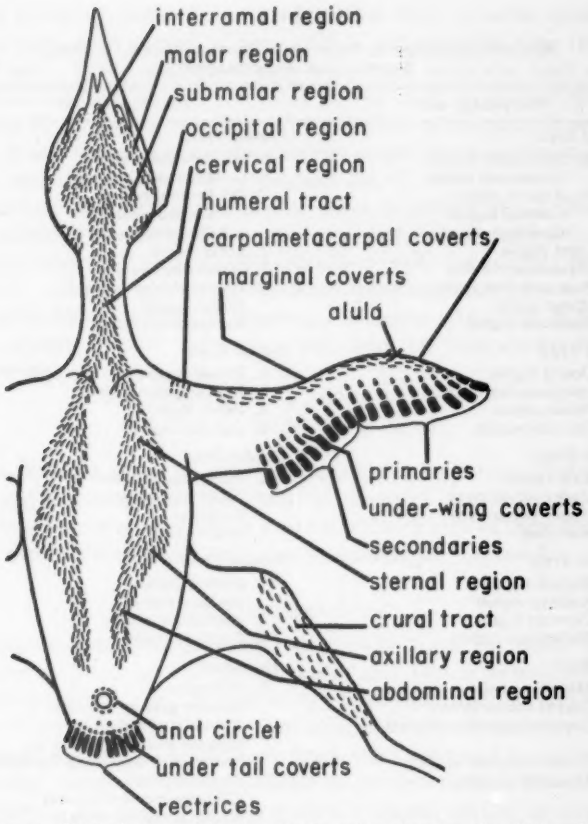


FIGURE 3. Ventral view of feather tracts and regions on the Yellow-throat.

proceeds proximally. This is just the opposite from what is found in the molt of the middle secondary coverts. The molts of the individual feathers occur in such rapid succession that the entire row of new feathers often appears to be in the same stage.

Primaries: These feathers molt one at a time starting with primary No. 1 (the most proximal) and proceeding to No. 9 (the most distal) in an even succession. However, the time interval between the molt of each successive primary is considerable, so that the molt for the entire row occurs over a comparatively long period. During this period the new feathers in all stages of development, as well as the older juvenal feathers, may be found at the same time.

TABLE I

MOLTING SEQUENCE OF REGIONS IN CAPITAL, SPINAL, CAUDAL, VENTRAL AND ALAR TRACTS[1]

Post-juvenal molt	*Post-nuptial molt*
Capital Tract	***Capital Tract***
1. (a) Sub-malar region Interramal region (b) Frontal region Coronal region Occipital region	1. (a) Sub-malar region Interramal region (b) Frontal region Coronal region Occipital region
2. Loral region	2. Loral region
3. Superciliary region Post-auricular region Malar region	3. Superciliary region Post-auricular region Malar region
4. Auricular region	4. Auricular region
Spinal Tract	***Spinal Tract***
1. Dorsal region	1. Dorsal region
2. Interscapular region	2. Interscapular region
3. Pelvic region	3. Pelvic region
4. Cervical region	4. Cervical region
Caudal Tract	***Caudal Tract***
1. Anal circlet	1. Upper tail-coverts Under tail-coverts
2. Under tail-coverts	2. Rectrices
3. Upper tail-coverts	3. Anal circlet
4. Rectrices	
Ventral Tract	***Ventral Tract***
1. Sternal region	1. Sternal region Axillary region
2. Axillary region	2. Abdominal region
3. Cervical region	3. Cervical region
4. Abdominal region	
Alar Tract	***Alar Tract***[2]
1. Middle secondary coverts Carpal remex covert	1. Primaries Greater primary coverts
2. Greater secondary coverts	2. Marginal coverts Greater secondary coverts
3. Under marginal coverts Marginal coverts	3. Secondaries (including Tertiaries) Alula coverts Carpometacarpal coverts Under marginal coverts
4. Lesser secondary coverts Alula coverts Carpometacarpal coverts Middle primary coverts	4. Middle secondary coverts Alula Under primary coverts Under secondary coverts
5. Primaries Greater primary coverts Under primary coverts	
6. Secondaries Under secondary coverts	
7. Alula	

[1] The regions within any numbered group may be said to start to molt about the same time as no invariable sequence was found for their order of molting.

[2] In the post-nuptial molt, the order of molt of the carpal remex covert, lesser secondary coverts, and middle primary coverts was not determined.

Greater primary coverts: These coverts differ from all other coverts in that they molt one at a time with a considerable time interval between. Their molt is directly correlated with the molt of the primaries which they cover; that is, the molt of greater primary covert No. 9 occurs at nearly the same time as the molt of primary No. 9, and the molt of greater primary covert No. 8 occurs at nearly the same time as the molt of primary No. 8.

Secondaries: The first secondary to molt is always No. 7 (feathers numbered from the distal to the proximal end of the row). The molt of this feather is usually coincident with the molt of primary No. 5. Like the primaries, the secondaries molt one by one with a considerable time interval between. However, the order of molt of this region is quite different. This may be best shown by the following:

1	2	3	4	5	6	7	8	9
4	5	6	7	9	8	1	2	3

Here, the top series of digits represents the individual feathers of the region, numbered from distal to proximal end of the row, and the lower series represents the order of molt for each of these feathers. The three tertiaries are counted in as secondaries 7, 8 and 9.

POST-NUPTIAL MOLT

A general outline of this molt was made from the study of the plumages of nine adults (seven males and two females) collected between August 9 and September 4. Each was molting and represented a certain stage in the post-nuptial molt. Inasmuch as the adult birds during this period were much more wary and secretive than usual, they were exceedingly difficult to procure as specimens. As a consequence, the outline for this molt is probably neither as complete nor as accurate as the outline for the post-juvenal molt.

The period of the post-nuptial molt for the Yellow-throat in this region is approximately 30 days, extending from about August 5 to September 4. This period represents the composite period of the post-nuptial molt for all of the Yellow-throats in this region, but not the period of molt for the individual bird, which is much shorter. This is evident from the fact that I collected an adult female on August 14 that had not started to molt and an adult male on August 22 which was just beginning its molt.

On the relatively few specimens which were available for the study of this molt, I could find no significant difference, from that found in the post-juvenal molt, in the manner of molt within the various

TABLE 2

ORDER OF MOLT FOR ALL FEATHER TRACTS AND REGIONS[1]

Post-juvenal molt	*Post-nuptial molt*
1. Dorsal region	1. Dorsal region
Sternal region	Interscapular region
Axillary region	Pelvic region
	Humeral tract
	Sternal region
	Axillary region
	Abdominal region
2. Interscapular region	2. Cervical region (spinal tract)
Pelvic region	Femoral tract
Humeral tract	Primaries
	Greater primary coverts
	Marginal coverts
	Greater secondary coverts
3. Interramal region	3. Frontal region
Submalar region	Coronal region
Femoral tract	Occipital region
	Interramal region
	Submalar region
	Crural tract
	Upper tail-coverts
	Under tail-coverts
	Rectrices
	Secondaries
	Alula coverts
	Carpometacarpal coverts
	Under marginal coverts
4. Frontal region	4. Loral region
Coronal region	Superciliary region
Occipital region	Malar region
Loral region	Auricular region
Anal circlet	Post-auricular region
Crural tract	Anal circlet
Cervical region (ventral tract)	Cervical region (ventral tract)
Abdominal region	Middle secondary coverts
Middle secondary coverts	Under wing-coverts
Greater secondary coverts	Alula
5. Cervical region (spinal tract)	
Under tail-coverts	
Under marginal coverts	
Marginal coverts	
6. Superciliary region	
Post-auricular region	
Malar region	
Upper tail-coverts	
Lesser secondary coverts	
Alula coverts	
Carpometacarpal coverts	
Middle primary coverts	
7. Auricular region	
Rectrices	
Primaries	
Greater primary coverts	
Under primary coverts	
8. Secondaries	
Under secondary coverts	
9. Alula	

[1] This table was prepared to show the various regions and tracts which were found starting to molt at approximately the same time, as well as to show the general order of molt. All regions and tracts included in one numbered group molt at about the same time. However, since the periods of molt for most of these regions and tracts overlap each other greatly, several of these groups may be found molting at the same time in any one bird.

regions. However, the order of molt for the various regions was in some cases quite different (Tables 1 and 2).

A comparison of the molting sequences as found in the post-juvenal and post-nuptial molts (Tables 1 and 2) shows that the order of molt in both the capital tract and the spinal tract is nearly the same, while the order of molt in the caudal, ventral and alar tracts is quite different. In the case of the caudal tract, the anal circlet is the first to molt in the post-juvenal molt and the last in the post-nuptial molt. In the ventral tract, the cervical region precedes the abdominal region in the post-juvenal molt, whereas the cervical region follows the abdominal region in the post-nuptial molt. It is in the alar tract, however, that one finds the most marked differences. Here, the middle secondary coverts are among the first to molt in the post-juvenal molt while they are among the last in the post-nuptial. The primaries and greater primary coverts are the very first regions to molt post-nuptially and among the last regions in the post-juvenal molt. There are also other minor differences which will be readily noted in comparing the lists in the two tables. There is a marked similarity in the order of molt of the alula which is found in the last group in both.

SUMMARY

The natal down feathers were usually present in five different tracts on the newly-hatched Yellow-throat. The post-natal molt starts at the end of the first day when the juvenal feathers begin to make their appearance. The juvenal feathers of the various regions and tracts protrude through the skin and finally break through their sheaths in an orderly sequence. By the end of the eighth day all of the juvenal feathers have broken through their sheaths except the rectrices and part of those feathers in the capital tract. The period for the post-juvenal molt begins with the appearance of the first-year feathers and sometimes overlaps the period of the post-natal molt. The post-juvenal molt, which involves all of the feathers, is also quite orderly, although it is different from the other molts in the sequence of the loss or appearance of the feathers of certain tracts and regions. The entire adult plumage is renewed in the post-nuptial molt which takes place in August and early September. The principal differences in the order of molt between the post-juvenal and post-nuptial molts are in the alar tract, although many other minor differences were noted.

Patuxent Research Refuge, U. S. Fish and Wildlife Service,
Laurel, Maryland, October 6, 1950.

SOME BIRDS FROM THE PALENQUE REGION OF NORTHEASTERN CHIAPAS, MEXICO

BY RICHARD E. TASHIAN

THIS report is based on a small collection of birds obtained by the author between July 5 and August 7, 1949, in the vicinity of the Maya ruins of Palenque, Chiapas, Mexico. These ruins, about six kilometers southwest of the town of Palenque, are situated in the northern foothills of the Sierra de Palenque at an altitude of 210 meters. The terrain is hilly, well-drained by numerous streams, and covered with heavy rainforest. The vegetation surrounding the main ruins has been cleared to the extent of approximately 60 acres. Brodkorb (Misc. Publ. Mus. Zool. Univ. Mich., No. 55, 1943) includes the Palenque region in the Tabascan faunal district which he defines as that Gulf lowland area occupied by the state of Tabasco, the southwestern corner of Campeche, and extreme northern Chiapas. Smith (Ann. Assoc. Amer. Geog., 39: 219–238, 1949) considers the ruins to be in the biotic region designated by him as the Palenque Province.

Seventy-seven forms were collected or observed. To the 95 species reported by Brodkorb (*op. cit.*) from the Palenque region, 36 have been added, of which eight had not previously been recorded from the Tabascan district as defined above. The majority of the specimens that were taken are now in the Chicago Natural History Museum.

Previously, birds have been collected at Palenque by E. W. Nelson and E. A. Goldman from May 10 to 21, 1900, and by Eizi Matuda from July 10 to 15, 1939. Palenque records based on the collection of Robert T. Moore are listed by Friedmann, Griscom, and Moore (Pacific Coast Avif., No. 29, 1950).

This work was supported in part with funds made available by the Purdue Research Foundation. The writer is grateful to Dr. and Mrs. Clarence J. Goodnight of Purdue University for making arrangements which facilitated work in the area of study. He is also indebted to Mr. Merle L. Kuns of Purdue University for valuable assistance in the field, to Mr. Emmet R. Blake of the Chicago Natural History Museum for services extended while comparing specimens, and to Dr. Pierce Brodkorb of the University of Florida for having answered numerous queries during the course of this study.

In the following list, the length of the larger testis is given in those birds whose gonads were conspicuously enlarged. Although nearly 40 per cent of the specimens examined were in various stages of molt, only those in a pronounced molting condition are indicated.

Tinamus major (Gmelin), GREATER TINAMOU.—Sex?, July 9; male, July 22, testis 20 mm.; and immature, sex?, July 22, 334 gm. No skins were prepared. Those collected on July 22 were taken from a group of three. The race here is most likely *robustus* as *percautus* probably does not get very far inland where the rainfall is heavy. Frequently heard calling.

Nyctanassa violacea violacea (Linnaeus), EASTERN YELLOW-CROWNED NIGHT HERON.—Immature female, August 5, in juvenal plumage. This was the only one seen. Not previously recorded from the Tabascan district.

Cochlearius cochlearius zeledoni (Ridgway), ZELEDON'S BOAT-BILLED HERON.—Male, July 26, iris dark brown, tarsi and feet light yellowish green. Collected at night from a low branch over a stream. This specimen was one of two seen together; its companion remained in the area for several days. The stomach contained a fish, *Priapella compressa*, and two shrimp, *Macrobrachium* sp. These were the only Boat-billed Herons observed.

Sarcoramphus papa (Linnaeus), KING VULTURE.—Seen on three occasions perched in forest trees.

Coragyps atratus (Bechstein), BLACK VULTURE.—Fairly common.

Cathartes aura (Linnaeus), TURKEY VULTURE.—Not nearly as common as the Black Vulture

Buteo magnirostris griseocauda Ridgway, MIRADOR INSECT HAWK.—Female, July 6, molting (rectrices), tail worn, iris yellow; and immature, sex?, July 18, 293.5 gm., iris brownish yellow. One of the stomachs contained a lepidopterous larva and the remains of a small mammal. The wing of the female measures 235 mm. Commonly seen perched in trees bordering cornfields (*milpas*).

Leucopternis albicollis (Latham), WHITE HAWK.—Pairs were noted soaring over the area on several occasions.

Crax rubra rubra Linnaeus, CENTRAL AMERICAN CURASSOW.—Female, July 10, molting (primaries, head), iris reddish brown. Taken on the ground in deep forest. Seen only on this one occasion.

Columba nigrirostris Sclater, SHORT-BILLED PIGEON.—Male, July 27, 167 gm., testis 12 mm.; and female, July 27, 188 gm., ova enlarged, iris pink, one egg in oviduct. These birds constituted a pair and were secured from the marginal forest bordering a small clearing at a height of about 10 meters. The crops were distended with numerous small berries. The specimens measure: male—wing, 169; tail, 126 mm.; and female—wing, 166; tail, 125 mm. This is a second Chiapas record; Friedmann, Griscom, and Moore (Pacific Coast Avif., No. 29, 1950) recorded it from Palenque.

Columbigallina talpacoti rufipennis (Bonaparte), RUDDY GROUND DOVE.—Male, August 4, 40.5 gm., iris pale grayish pink. Common in clearing near the ruins and occasionally noted with *Claravis pretiosa*.

Claravis pretiosa (Ferrari-Perez), BLUE GROUND DOVE.—Female, July 17, 71 gm., iris yellow. The wing measures 110 mm. and the tail 77 mm. Often seen in clearing near the ruins in flocks of six to eight. Not as abundant as *Columbigallina talpacoti*. This is the first record of this dove from the Tabascan district.

Pionus senilis senilis (Spix), WHITE-CROWNED PARROT.—Male, July 8, 220 gm., testis 5 mm. Common. The local inhabitants habitually shot these parrots when they invaded their cornfields.

Piaya cayana thermophila Sclater, CENTRAL AMERICAN SQUIRREL CUCKOO.—Female, August 4, 92.3 gm., ova somewhat enlarged, molting (primaries, rectrices, head). It had eaten miscellaneous insects, some of which were homoptera and hemiptera. Species not often observed.

Crotophaga sulcirostris Swainson, GROOVE-BILLED ANI.—A few in clearing.

Ciccaba nigrolineata Sclater, BLACK AND WHITE WOOD OWL.—Female, July 12, 443 gm., molting (primaries); and female, August 5, 468 gm., ova somewhat enlarged. Iris light brown; bill and feet yellow. Both owls were collected at night near the forest border. The bulk of their food consisted of large insects including beetles, tettigoniids, and cicadids. One stomach contained the remains of a bat, *Pteronotus davyi*. This owl has not previously been recorded from the Tabascan district. These females measure: wing, 276 and 282; tail, 172 and 173 mm.

Phaethornis superciliosus veraecrucis Ridgway, VERA CRUZ HERMIT.—Sex?, July 7, 6 gm.; and sex?, July 31, 7 gm., molting (primaries). The tails were not fully grown in either specimen. One of the stomachs contained numerous onopiid spiders. Common, especially in the lower forest where they continually chirp when disturbed.

Campylopterus hemileucurus hemileucurus (Lichtenstein), DE LATTRE'S SABRE-WING.—Male, July 15, 12.5 gm. Rather common in forest and along forest edge.

Amazilia tzacatl tzacatl (De la Llave), RIEFFER'S HUMMINGBIRD.—Male, July 7, 5 gm. Common. A fledgling was observed on July 30.

Trogon melanocephalus Gould, BLACK-HEADED TROGON.—One noted on July 25 in the marginal forest.

Trogon massena massena Gould, MASSENA TROGON.—Male, August 2, 162 gm., molting (rectrices, head); iris light golden brown, skin around eyes pinkish orange, legs gray (scutes along lower tarsi and feet yellow), tail very worn. It had been eating insects and fruit.

Chloroceryle americana septentrionalis (Sharpe), TEXAN GREEN KINGFISHER.—Female, July 8, 37 gm. The stomach contents included the remains of a crab, *Pseudothelphusa* sp. Of regular occurrence along forest water-courses.

Momotus momota goldmani Nelson, GOLDMAN'S MOTMOT.—Immature, sex?, July 6, 93 gm., molting (primaries, rectrices, head); and male, July 9, 90 gm. The tail of the immature bird is not fully grown, and that of the adult is not completely racketted. The stomachs contained large insects and fruit. A dead fledgling was found on July 17 in the courtyard of one of the ruins. Frequently observed and heard.

Notharcus macrorhynchos hyperrhynchus Sclater, WHITE-FRONTED PUFFBIRD.—Male, July 21, 90.5 gm. Its food consisted of beetles and caterpillars. This puffbird has not previously been recorded from the Tabascan district. Wing, 113; tail, 91 mm. Uncommon.

Malacoptila panamensis inornata (Du Bus), WHITE-WHISKERED SOFT-WING.—Male, July 5, 33 gm.; female, July 27, 41 gm., ova enlarged; and male, August 6, 36 gm. Two stomachs contained parts of beetles and grasshoppers. Encountered often in the forest understory and occasionally along the forest border.

Galbula melanogenia Sclater, BLACK-CHINNED JACAMAR.—One seen on July 17.

Ramphastos sulfuratus Lesson, KEEL-BILLED TOUCAN.—Often seen passing through the area in flocks of eight to ten.

Pteroglossus torquatus torquatus (Gmelin), COLLARED ARACARI.—Male, July 8, testis 7 mm., molting (primaries, rectrices, head); and immature female, July 29, 184 gm. The upper mandible of the immature bird was dark greenish brown along the culmen becoming light grayish green laterally and dull orange baso-laterally; the lower mandible was horn brown becoming dark brown terminally and along the tomia. Measurements of five males of *P. t. torquatus* from eastern Tabasco and northern Chiapas (Brodkorb, Misc. Publ. Mus. Zool. Univ. Mich., No. 55, 1943) show an intermediacy to *P. t. erythrozonus*. The adult male here collected, however, is typical *torquatus* in size, measuring: wing, 148; tail, 156; culmen, 110 mm. Large

insects and fruit, including citrus pulp and seeds, were present in the stomachs. Apparently not as common as *Ramphastos sulfuratus*.

Melanerpes pucherani perileucus (Todd), WHITE-BARRED WOODPECKER.—Female, July 26, 61 gm., molting (primaries, head), ova enlarged; and female, August 4, 51 gm. The greater portion of the stomach contents of each bird was made up of vegetable matter but some insect larvae were present. Common along the forest edge where they were often observed feeding on the fruit of the trumpet tree, *Cecropia* sp.

Celeus castaneus (Wagler), CHESTNUT-COLORED WOODPECKER.—Male, August 3, 80.5 gm. The stomach contained numerous ants and some seeds.

Phloeoceastes guatemalensis guatemalensis (Hartlaub), GUATEMALAN IVORY-BILLED WOODPECKER.—Female, July 13, 232 gm.; and female, July 24, 222 gm. Both birds had eaten only wood-boring beetle larvae. *P. guatemalensis* and *C. castaneus* appeared to be the most common forest woodpeckers.

Xiphorhynchus flavigaster eburneirostris Des Murs, IVORY-BILLED WOODHEWER.—Female, July 30, 43 gm.; and sex?, July 15. The stomachs contained insects and lepidopterous larvae. Commonly associated with mixed forest flocks.

Dendrocolaptes certhia sancti-thomae Lafresnaye, BARRED WOODHEWER.—Female, August 2, 63 gm., ova somewhat enlarged. Two snails plus many insect parts, including a large beetle, were contained in the stomach. The specimen measures: wing, 115; tail, 124 mm. This woodhewer has not previously been recorded from the Tabascan district.

Automolus ochrolaemus cervinigularis (Sclater), BUFF-THROATED AUTOMOLUS.—Female, July 9, 46 gm. Taken from a thicket bordering a cornfield.

Taraba major melanocrissa (Sclater), GREAT ANT-SHRIKE.—Female, July 6, 73 gm., ova enlarged, molting (rectrices).

Microrhopias quixensis boucardi (Sclater), BOUCARD'S ANT-WREN.—Female, July 5, 9.5 gm., molting (rectrices), one egg was present in the oviduct; and male, August 3, molting (primaries, head). The male was one of two birds, probably a pair.

Formicarius analis moniliger Sclater, MEXICAN ANT-THRUSH.—Male, July 9, 58 gm., testis 12 mm. Taken near the ground in deep forest.

Cotinga amabilis Gould, LOVELY COTINGA.—Female, July 20, 73.5 gm. Collected in deep forest. This was the only cotinga collected that had eaten fruit; specimens of the following five species had eaten only insects. Seemingly uncommon.

Attila spadiceus flammulatus Lafresnaye, FLAMMULATED ATTILA.—Immature, sex?, August 5, 41 gm. Taken from a mixed flock of about five forest birds of which one was *Lanio aurantius*.

Rhytipterna holerythra holerythra (Sclater and Salvin), RUFOUS MOURNER.—Female, August 5, 33 gm., iris brown. Secured in heavy forest. It measures: wing, 100; tail, 90 mm. This is the second Mexican record of this cotinga. Heretofore, three specimens recorded by Blake (Nat. Hist. Misc., No. 42, 1949) from Tutla, Oaxaca, comprised the first definite Mexican record. An earlier tentative record was based on an unsexed adult skin labeled "Mexico" in the British Museum.

Lipaugus unirufus unirufus Sclater, RUFOUS PIHA.—Male, August 5, 84.8 gm., testis 8 mm., molting (primaries, rectrices, head). Rarely seen but frequently heard, responding instantly to any loud noise such as thunder or a gun shot. Its call is a sharp, explosive cry with a downward inflection.

Pachyramphus cinnamomeus fulvidior Griscom, CINNAMON BECARD.—Immature male, July 8, 19 gm.; and female, July 22, 19.5 gm. An abundant bird of the forest and forest edge. A nest was discovered on July 16 near the top of a trumpet tree about 10 meters from the ground. It was somewhat spherical in appearance and measured roughly 25 cm. in diameter. No further nesting was noted after July 26.

Platypsaris aglaiae sumichrasti Nelson, SUMICHRAST'S ROSE-THROATED BECARD.—Male, July 27, 33 gm.

Pipra mentalis mentalis Sclater, YELLOW-THIGHED MANAKIN.—Male, August 4, 16 gm., testis 6 mm.

Megarhynchus pitangua mexicanus (Lafresnaye), MEXICAN BOAT-BILLED FLYCATCHER.—Male, July 13, 69 gm. Observed daily along the marginal forest and in isolated trees of clearings. Most often seen in small flocks.

Myiozetetes similis texensis (Giraud), GIRAUD'S FLYCATCHER.—Immature female, July 10, 30 gm. The bulk of the stomach contents was made up of vegetable matter, with some insects present. Common in clearings and forest edge.

Pitangus sulphuratus guatimalensis (Lafresnaye), CENTRAL AMERICAN DERBY FLYCATCHER.—Female, July 18, 62 gm., molting rectrices. A large caterpillar was found in the stomach. A common species of the forest border and cornfields.

Contopus cinereus brachytarsus (Sclater), SHORT-LEGGED PEWEE.—Male, July 20, 12 gm.

Empidonax minimus (Baird and Baird), LEAST FLYCATCHER.—Male, August 6, 11 gm. One of two taken from the top of a brush pile in a clearing. This appears to be the earliest published fall record for Chiapas.

Myiobius sulphureipygius sulphureipygius (Sclater), SULPHUR-RUMPED MYIOBIUS.—Female, July 14, 11 gm. Secured in heavy forest from a small mixed flock including ant tanagers, *Habia* sp.

Onychorhynchus mexicanus mexicanus (Sclater), MEXICAN ROYAL FLYCATCHER.—Female, August 4, 18 gm. A nest was found on July 9 attached to the end of a thin vine about eight meters long, and suspended four meters above a forest stream. The pensile nest, constructed mainly of roots, grass, and moss, measured 60 by 15 centimeters with a side entrance four centimeters in diameter. Two unoccupied nests, similar in construction to that described, were located five and eight meters away. Observations were made on the afternoon of July 11. During that time 12 feedings were noted; the intervals ranging from five to 38 minutes with an average of 3.6 feedings per hour. The pattern of approach and departure was usually the same; the bird first coming to a certain bush (A) about three meters from the nest, and then flying to another bush six meters away on the opposite stream bank, before finally going to the nest. Upon leaving, it would fly back to bush A where it invariably engaged for a minute in preening, spreading its tail and wing feathers, raising its crest, calling, and finally flying away either up or downstream. Its call was a plaintive '*wee-aah*,' slurring downward. No further nesting was noted after July 13.

Platyrinchus mystaceus cancrominus Sclater and Salvin, MEXICAN SPADE-BILLED FLYCATCHER.—Immature male, August 4, 12 gm., molting (primaries); and immature, sex?, August 4, 9.5 gm. These specimens were taken about 40 meters apart in the forest understory. One had been eating ants.

Elaenia viridicata placens Sclater, PLACID ELAENIA.—Male, July 27, 13 gm., testis 5.5 mm., molting (primaries, rectrices); and male, July 31, 13 gm., testis 6 mm., molting (primaries, rectrices). These were collected in the vicinity of forest-edge flocks numbering 10 to 14 birds. The stomachs contained insect parts, some of which were of ants and hemiptera.

Leptopogon amaurocephalus pileatus Cabanis, BROWN-CAPPED LEPTOPOGON.—Female, July 16, 15.2 gm. One of two seen together in a small forest-edge flock.

Campylorhynchus zonatus restrictus Nelson, TABASCO CACTUS WREN.—Male, July 26, 41 gm., testis 5.5 mm.; and sex?, August 4, 36 gm. Iris red; tarsi and feet buff. The wings measure: male, 87 mm.; sex?, 83 mm. The tails of both specimens are

very worn. Common. These wrens were secured from forest-edge flocks numbering eight to 12 birds. One flock included tanagers of the genus *Tanagra*. This appears to be the first record of this race from Chiapas.

Thryothorus rutilus umbrinus Ridgway, GUATEMALAN SPOTTED-BREASTED WREN.—Male, July 21, 17.5 gm. Common in the lower forest levels and constantly observed feeding in the tall weeds and grasses of the clearings. A nest was discovered on July 29 along the forest edge bordering a small clearing. It was situated about 13 cm. from the ground in the crotch of a fern and contained two nestlings. The nest was dome-shaped and measured 10 by 15 centimeters with a side entrance four centimeters in diameter. During a brief observation of the nest on the afternoon of July 30, three feedings were noted in an hour and 15 minutes. Both parents were present at the nest on one of these feedings and alternately fed the young. The nest was abandoned by noon of the following day.

Henicorhina leucosticta prostheleuca (Sclater), SCLATER'S WOOD WREN.—Male, July 15, 15.5 gm., testis 5.5 mm. Collected near the ground from a flock in deep forest. Often found in association with *Thryothorus rutilus* and, like *T. rutilus*, this wren was common in both forest and clearing.

Cyanerpes cyaneus carneipes (Sclater), CENTRAL AMERICAN BLUE HONEYCREEPER.—Male, July 5, 11 gm., testis 8 mm.; immature male, July 28, 14 gm.; and female, August 2, 13 gm. The immature male is in an advanced stage of postjuvenal plumage with black wings, cerulean crown-patch coming in, and the underparts and back spotted with black and blue. Two were secured from forest-edge flocks containing *Tanagra gouldi* and *Tanagra lauta*. Stomachs of two specimens contained fruit with small seeds. The measurements are—males: wing, 60–63; tail, 36.5–38 mm.—female: wing, 57; tail, 35 mm. Encountered often in second growth areas as well as in the forest. Not previously reported from the Tabascan district.

Seiurus motacilla (Vieillot), LOUISIANA WATER-THRUSH.—Male, July 21, 20 gm.; and female, August 2, 19.5 gm. The August specimen was one of two. Between July 12 and August 2, five of these water-thrushes were observed on four occasions feeding along forest streams. The July dates are the earliest recorded for Chiapas, and the birds have not been previously recorded from the Tabascan district.

Amblycercus holosericeus holosericeus (Lichtenstein), PREVOST'S CACIQUE.—Female, July 9, 77 gm., ova enlarged, iris yellow; one egg present in oviduct. This and all of the following three species of icterids were collected in the vicinity of cornfields.

Psomocolax oryzivorus impacificus Peters, RICE GRACKLE.—Immature female, August 7, 133 gm., iris brown. The bill of this grackle was largely horn colored and streaked throughout with brownish black, the base of the lower mandible being yellowish. This condition is probably due to immaturity.

Icterus prosthemelas prosthemelas (Strickland), LESSON'S ORIOLE.—Immature female, July 21, 25 gm. This specimen is in first plumage. A lepidopterous larva was found in the stomach.

Icterus mesomelas mesomelas (Wagler), YELLOW-TAILED ORIOLE.—Female, July 21, 42 gm. The ovary contained three enlarged ova measuring six, four, and three millimeters in diameter. Spiders and beetles had been eaten.

Tanagra lauta lauta Bangs and Penard, BONAPARTE'S EUPHONIA.—Male, July 17, 16 gm., testis 8 mm.; and male, August 2, 15.5 gm., molting (primaries). These were secured from flocks in the marginal forest. Quite common.

Tanagra gouldi gouldi (Sclater), GOULD'S EUPHONIA.—Female, July 16, 14.8 gm., ova enlarged; male, July 19, 14.8 gm.; male, July 28, 15 gm.; and male, July 28, 15.5 gm. Two were taken from treetop flocks in heavy forest. All had been eating small-seeded fruits. A very common flocking species of the forest and forest border.

Tanagra nigrocincta larvata (Du Bus), GOLDEN-MASKED TANAGER.—Male, August 4, 23 gm., testis 6 mm. Collected along the forest edge from a mixed flock of which *Campylorhynchus zonatus* formed the nucleus.

Ramphocelus passerinii passerinii Bonaparte, PASSERINI'S TANAGER.—Male, July 5, 29 gm., testis 10 mm., iris red. Fairly common in second growth areas.

Phlogothraupis sanguinolenta sanguinolenta (Lesson), CRIMSON-COLLARED TANAGER.—Male, July 12, 44 gm., testis 10 mm.; and female, July 18, 38 gm., ova enlarged. Common.

Piranga leucoptera leucoptera Trudeau, WHITE-WINGED TANAGER.—Immature male, juvenal plumage, July 26, 16 gm. Seemed to be scarce.

Habia rubica rubicoides (Lafresnaye), MEXICAN ANT TANAGER.—Immature male, July 5, 33 gm., molting (primaries); female, July 14, 36 gm.; male, July 31, 41 gm., molting (primaries, rectrices, head); and immature male, July 31, 36 gm., molting (primaries, rectrices, head). Stomachs contained insects, vegetable matter, and snails. A very common flocking species and often associated with *Habia gutturalis* and smaller tanagers.

Habia gutturalis littoralis (Nelson), TABASCO ANT TANAGER.—Male, July 6, 43 gm., testis 8 mm. Similar in habits to *Habia rubica*, but not as common.

Lanio aurantius aurantius Lafresnaye, MEXICAN SHRIKE TANAGER.—Male, July 22, 38.5 gm.; and male, August 5, 38 gm. Taken in deep forest from small flocks.

Caryothraustes poliogaster poliogaster (Du Bus), BISHOP GROSBEAK.—Male, July 7, 47 gm., testis 6.5 mm.; male, July 19, 47.5 gm.; and female, July 23, 46 gm. Flocks of 15 to 18 were often observed passing through the marginal forest as well as the forest interior.

Cyanocompsa cyanoides concreta (Du Bus), BLUE-BLACK GROSBEAK.—Male, July 29, 36 gm., testis 8.5 mm. It had been eating seeds, insects, and spiders. Not uncommon. Noted in the forest and along the brushy borders of clearings.

Sporophila torqueola Bonaparte, CINNAMON-RUMPED SEEDEATER.—Frequently seen in the trees of clearings. A nest was found on July 22 in a citrus tree located in a clearing. It was a loosely woven, cup-like structure, nine centimeters in diameter, and situated about 2.5 meters from the ground. Young still being fed July 29.

Volatinia jacarina splendens (Vieillot), NORTHERN BLUE-BLACK GRASSQUIT.—Male, July 9, 5 gm., testis 5 mm. It had been eating small caterpillars and seeds. An abundant flocking bird of the clearing herbage. Similar in habits to the wrens, *T. rutilus* and *H. leucosticta*, and often associated with those species.

Arremonops conirostris chloronotus (Salvin), GREEN-BACKED SPARROW.—Sex?, August 4, 30 gm.; and male, August 5, 26 gm., testis 8.5 mm. Fairly common along the brushy edges of clearings.

Department of Biological Sciences, Purdue University, West Lafayette, Indiana, February 24, 1951.

THE SIXTY-NINTH STATED MEETING OF THE AMERICAN ORNITHOLOGISTS' UNION

BY OLIN SEWALL PETTINGILL, JR., SECRETARY

THE second meeting of the Union in the Province of Quebec and the fifth meeting in Canada was held in Montreal, October 8 to 11, 1951, at the invitation of the Province of Quebec Society for the Protection of Birds. Headquarters were in the Mount Royal Hotel where the business sessions took place on Monday; public sessions were held at McGill University on Tuesday, at the University of Montreal on Wednesday, and at the Botanical Garden on Thursday.

BUSINESS SESSIONS

Business sessions were as follows: (1) First Session of the Council, Monday, October 8, 9:15 a. m. to 12:10 p. m. Number in attendance, 20. (2) Second Session of the Council, Monday, 2:15 to 3:45 p. m. Number in attendance, 21. (3) First Meeting of the Fellows, Monday, 4:10 p. m. to 5:30 p. m. Number in attendance, 34. (4) Third Session of the Council, Monday, 8:20 to 8:30 p. m. Number in attendance, 17. (5) Meeting of the Fellows and Members, Monday, 8:30 p. m. to Tuesday, October 9, 12:35 a. m. Number in attendance, 62 (Fellows, 30; Members, 32). (6) Fourth Session of the Council, Wednesday, October 10, 8:10 to 8:30 a. m. Number in attendance, 16. (7) Second Meeting of the Fellows, Wednesday, 12:10 to 12:30 p. m. Number in attendance, 26.

Reports of Officers. The Secretary reported that the total membership of the Union was 2,914, as of October 8, 1951. Membership by classes was as follows: Fellows, 64; Fellows Emeriti, 2; Honorary Fellows, 14; Corresponding Fellows, 63; Members 171; Associates, 2,580; and Student members, 20. Since the last meeting, 261 persons had been proposed for Associate membership, their election at this meeting bringing the total membership to 3,175. The Secretary had received death notices of the following members:

Lynds Jones, Fellow, February 11, 1951, at Oberlin, Ohio.

Marcel Henri Felix de Contreras, Corresponding Fellow, December 28, 1949, at Ixelles, Belgium.

Herman Grote, Corresponding Fellow, August 12, 1951, at Berlin, Germany.

Pawel Pateff, Corresponding Fellow, March 22, 1950, at Sofia, Bulgaria.

Charles Theodore Ramsden, Corresponding Fellow, August 24, 1951, at Santiago, Cuba.

Bernard William Tucker, Corresponding Fellow, December 19, 1950, at Oxford, England.

Rollo Howard Beck, Life Member, November 22, 1950, at Planada, California.
William Procter, Life Member, April 19, 1951, at West Palm Beach, Florida.
Edward Russell Ford, Member, January 13, 1951, at Winnetka, Illinois.
Arthur Baldwin Williams, Member, August 18, 1951, at Cleveland, Ohio.
Walter Allen Angell, Honorary Life Associate, February 5, 1950, at Smithfield, Rhode Island.
Edmonde Samuel Currier, Honorary Life Associate, April 25, 1949, at Portland, Oregon.
Annie Montague Alexander, Life Associate, September 10, 1950, at Oakland, California.
Albert Joseph Bernard Kirn, Life Associate, October 1, 1950, at San Antonio, Texas.
Leonard Cutler Sanford, Life Associate, December 7, 1950, at Port Sewall, Florida.
Ross Stewart Baker, Associate, March 27, 1951, at Toronto, Ontario.
William Bonar Bell, Associate, March 30, 1949, at Washington, D. C.
Sherman Chauncey Bishop, Associate, May 28, 1951, at Rochester, New York.
Ewart Lount Brereton, Associate, July 5, 1950, at Barrie, Ontario.
Edgar Burke, Associate, December 6, 1950, at Norfolk, Connecticut.
Elizabeth Rand Cox, Associate, November 9, 1950, at Plainfield, New Jersey.
Alden Hervey Hadley, Associate, February 26, 1951, at Anderson, Indiana.
Mrs. Ardelle Hornback, Associate, August 18, 1950, at Joliet, Illinois.
John Southgate Yeaton Hoyt, Associate, June 1, 1951, at Ithaca, New York.
Ellsworth Duganne Lumley, Associate, February 10, 1950, at Seattle, Washington.
George MacReynolds, Associate, October 27, 1950, at Doylestown, Pennsylvania.
John Edward Maher, Associate, April 19, 1950, at Jersey City, New Jersey.
Orpheus Moyer Schantz, Associate, September 2, 1951, at Red Bank, New Jersey.
Mary Hall Schaub, Associate, April 15, 1950, at Wilmette, Illinois.
Eugene William Schmidt, Associate, August 27, 1951, at New Britain, Connecticut.
Samuel Scoville, Jr., Associate, December 4, 1950, at Bryn Mawr, Pennsylvania.
Grace Marion Snow, Associate, February 6, 1950, at Winchester, Massachusetts.
Wilson Tout, Associate, June 18, 1951, at North Platte, Nebraska.

The Treasurer gave his report, which is published in this number of 'The Auk.'

Dr. Harvey I. Fisher, Editor of 'The Auk,' reported that he has enough short manuscripts on hand to fill out the next two or three issues, but he is in great need of leading articles containing fundamental information. He expressed disappointment that many manuscripts of superior quality, prepared by members, have been submitted to journals other than 'The Auk.' It seemed to him that members of the Union should feel obliged to support their own journal. The new Illustrations Committee, under the Chairmanship of Dr. Milton B. Trautman, has been of invaluable assistance in obtaining suitable material for colored and for black and white plates.

Reports of Committees. The Committee on Endowment, through an appeal for funds directed by Mrs. Elsie M. B. Naumburg, Chairman, obtained the following results: Life Memberships including partial payments $1,705.00; donations to the Endowment Fund, $465.50; and donations to the Active Publication Fund, $868.00.

The report of the Special Canadian Committee, given by Mr. Hoyes Lloyd, Chairman, showed total receipts since September 15, 1950, of $1,077.57. Total assets in Canada, as of September 15, 1951, were $5,378.24.

Dr. Alexander Wetmore, Chairman of the Committee on Classification and Nomenclature of North American Birds, reported that the Committee prepared in draft form a revision of the ranges of the Tyrannidae and Parulidae for circulation among its collaborators for criticism, comment, and addition. The Committee considered 43 cases covering changes in scientific name or status, proposals of new forms, or revivals of old forms; 19 of these were accorded favorable action and published in 'The Auk' for July, 1951. The Committee continued to employ Mr. E. M. Reilly to assemble records from the files of the Fish and Wildlife Service and from literature, for use in the preliminary preparation of range material. The expense of this service was met through grants from the Smithsonian Institution, the expenditures to date being $10,257.50. The typing, mimeographing, and mailing of range material to collaborators, and the considerable correspondence of the Chairman and Vice-Chairman, were carried by the Smithsonian Institution, in addition to the cash contribution.

According to Dr. Albert Wolfson, Chairman of the Committee on Research, the book on recent research in ornithology, being prepared under the direction of the Committee, is rapidly nearing completion. Three chapters have been written, while the others have been promised by the end of the calendar year. The Committee's index of unpublished doctoral theses will soon be published.

Following the procedure of previous years, the Committee on Education, under the Chairmanship of Dr. William H. Behle, distributed application blanks for student membership awards to 87 regional representatives. Dr. Behle reported that 20 applications were received and, since sufficient funds were available, all applications were granted. Recipients were notified in early January that they were entitled to a year's subscription to 'The Auk.'

Mr. C. K. Nichols, Editor of the 'Ten-year Index to The Auk,' reported that all articles, notes, and main reviews have been indexed. As soon as the sections on "Periodical Literature" have been covered, the work will be ready for publication.

Work on the 'Handbook of North American Birds,' sponsored by the Union with Dr. Ralph S. Palmer as Editor, is already under way. Dr. Palmer has enlisted several collaborators. A part-time assistant, provided through the cooperation of the New York State Museum, is helping him with bibliographical work.

The Award of the Brewster Medal. The 1951 Brewster Medal was awarded, by action of the Council, to Dr. S. Charles Kendeigh of the University of Illinois for his fundamental research on temperature characteristics, metabolism, and energy resources of birds.

Next Stated Meeting. Fellows and Members, meeting together, accepted the joint invitation of Louisiana State University and the Louisiana Ornithological Society to hold the Seventieth Stated Meeting in Baton Rouge in October, 1952.

Amendments to the By-Laws. Eleven amendments to the By-Laws were given final approval by the Fellows. (For a listing of these amendments as approved, see the January, 1951, number of 'The Auk.')

Three amendments were proposed and referred to the Fellows for final action in 1952. The first would permit the electing of Associates during the year rather than at annual meetings only. This would necessitate three changes in Article IV: (1) delete "and Associates" from first sentence of first paragraph in Section 7; (2) omit second paragraph in Section 7; and (3) add Section 12 to read as follows:

> "*Section 12.* Proposals for the Class of Associates may be made to a committee of the Officers of the Union, consisting of the President, Vice-Presidents, Secretary, and Treasurer, through the Secretary, by any Fellow, Member, or Associate. Associates may be elected by an affirmative vote of a majority of said committee. Election may be by mail ballot at any time of year."

The second and third amendments would extend to ornithologists in the Americas outside of the United States and Canada the opportunity of being elected to the classes of Fellows and Members. The second amendment would revise the first sentence in Section 2 of Article I to read: "Fellows at the time of their election shall be citizens, subjects, or residents of the United States, Canada, or other political subdivisions of North America, South America, or the West Indies." The third amendment would revise Section 6 of Article I to read as follows:

> "*Section 6.* Members at the time of their election shall be citizens, subjects, or residents, of the United States, Canada, or other political subdivisions of North America, South America, or the West Indies. Members shall be limited to two hundred in number."

Miscellaneous Matters. The Council authorized the establishment of a Special Publications Fund. Henceforth, money derived from the sales of any, or all, occasional publications (*e. g.* 'The Ten-year Index to The Auk,' the 'Check-List of North American Birds') will be put into this Fund which will be kept separate for the purpose of financing such occasional publications.

Since John T. Nichols has, over a period of years, generously given to the Union sums of money totalling well over one thousand dollars, the Council elected him a Patron. His name, therefore, shall be perpetually inscribed upon the records of the Union.

ELECTION OF OFFICERS

The officers elected for 1951 are as follows: *President*, Josselyn Van Tyne; *Vice-Presidents*, Alden H. Miller and Ludlow Griscom.; *Secretary*, Albert Wolfson; *Treasurer*, R. Allyn Moser. *Elective Members of Council:* Dean Amadon, Harrison F. Lewis, and Olin Sewall Pettingill, Jr.

The Council elected Harvey I. Fisher, *Editor*, and Robert W. Storer, *Assistant Editor* of 'The Auk'; Frederick V. Hebard (Chairman), G. Ruhland Rebmann, Jr., and Phillips B. Street, *Investing Trustees*.

ELECTION OF FELLOWS, MEMBERS, AND ASSOCIATES

FELLOWS—6

William Harroun Behle, Salt Lake City, Utah.
Lee Saunders Crandall, New York City.
Eugene Pleasants Odum, Athens, Georgia.
Sidney Dillon Ripley, New Haven, Connecticut.
Arlie William Schorger, Madison, Wisconsin.
Lawrence Harvey Walkinshaw, Battle Creek, Michigan.

HONORARY FELLOWS—2

Arthur Landsborough Thomson, London, England.
Konrad Lorenz, Altenberg, Germany.

CORRESPONDING FELLOWS—4

Edward Allworthy Armstrong, Cambridge, England.
James Maxwell McConnell Fisher, Ashton, Northampton, England.
Carl Alexander Gibson-Hill, Singapore, Malaya.
Gustav Kramer, Wilhelmshaven, Germany.

MEMBERS—15

Harold Hamilton Axtell, Buffalo, New York.
Aaron Moore Bagg, Holyoke, Massachusetts.
Barbara Blanchard Oakeson, Santa Barbara, California.
Eugene Eisenmann, New York City.
Samuel Andrew Grimes, Jacksonville, Florida.
William Walker Hamilton Gunn, Toronto, Ontario.
Frederick Vanuxem Hebard, Philadelphia, Pennsylvania.
Robert Allerton McCabe, Madison, Wisconsin.

Karl Herbert Maslowski, Cincinnati, Ohio.
Robert Morrow Mengel, Ann Arbor, Michigan.
Johnson Andrew Neff, Denver, Colorado.
Angus Henry Shortt, Winnipeg, Manitoba.
Harrison Bruce Tordoff, Lawrence, Kansas.
Dwain Willard Warner, Minneapolis, Minnesota.
Lloyd Raymond Wolfe, Kerrville, Texas.

ASSOCIATES—261

ATTENDANCE

Registration at the meeting showed an attendance of 174, composed of 36 Fellows, 43 Members, and 95 Associates. Represented were 25 states, the District of Columbia, four provinces of Canada, and Venezuela. Attendance of 88 guests brought total registration to 262.

FELLOWS, MEMBERS, AND ASSOCIATES PRESENT

PATRONS:—Hoyes Lloyd, Mrs. Dayton Stoner.

FELLOWS:—John W. Aldrich, Arthur A. Allen, Dean Amadon, Oliver L. Austin, Jr., Maurice Brooks, James P. Chapin, H. G. Deignan, Jean Delacour, John T. Emlen, Jr., Harvey I. Fisher, Herbert Friedmann, Ira N. Gabrielson, Ludlow Griscom, Alfred O. Gross, Harrison F. Lewis, Frederick C. Lincoln, Hoyes Lloyd, George H. Lowery, Jr., Ernst Mayr, Alden H. Miller, Robert Cushman Murphy, Mrs. Margaret M. Nice, James L. Peters, Roger Tory Peterson, Olin Sewall Pettingill, Jr., Frank A. Pitelka, S. Dillon Ripley, Aretas A. Saunders, A. W. Schorger, L. L. Snyder, Alexander Sprunt, Jr., W. E. Clyde Todd, Winsor M. Tyler, Josselyn Van Tyne, Alexander Wetmore, John T. Zimmer.

MEMBERS:—Mrs. Elsa G. Allen, Rudolph M. Anderson, Harold H. Axtell, Aaron M. Bagg, Charles H. Blake, Emmet R. Blake, B. S. Bowdish, Charles L. Broley, C. H. D. Clarke, Allan D. Cruickshank, E. Thomas Gilliard, W. Earl Godfrey, Horace Groskin, W. W. H. Gunn, Joseph A. Hagar, H. W. Hann, Frederick V. Hebard, George E. Hudson, Francis L. Jaques, Robert A. Johnson, Peter Paul Kellogg, C. Russell Mason, Harold Mayfield, Harold D. Mitchell, Burt L. Monroe, R. Allyn Moser, Mrs. Elsie M. B. Naumburg, Ralph S. Palmer, Harold S. Peters, W. H. Phelps, Jr., Richard H. Pough, William F. Rapp, Jr., Chandler S. Robbins, James Savage, Wendell P. Smith, W. A. Squires, Robert W. Storer, Wendell Taber, Lewis M. Terrill, Milton B. Trautman, Dwain W. Warner, Leonard W. Wing, Albert Wolfson.

ASSOCIATES:

British Columbia, 1—Allan C. Brooks, Pender Island.
California, 1—Mrs. Enid K. Austin, Oakland.
Connecticut, 2—Charles E. Huntington, Hamden; Raymond A. Paynter, Jr., Hamden.
Florida, 1—J. C. Dickinson, Jr., Gainesville.
Illinois, 1—Karl E. Bartel, Blue Island.
Kentucky, 1—Donald Summerfield, Valley Station.
Massachusetts, 3—Jerram L. Brown, Amherst; Dorothy E. Snyder, Salem; George C. West, Newton Center.
Michigan, 2—Mrs. Edith K. Frey, Jackson; Mrs. Josselyn Van Tyne, Ann Arbor.
New Jersey, 4—Mrs. Charles B. Andrews, Clinton; Mrs. Herbert E. Carnes, Tenafly; Edward L. Chalif, Short Hills; J. d'Arcy Northwood, Montclair.

New York, 26—Clark S. Beardslee, Kenmore; Mrs. Albert R. Brand, New York City; Carl A. Buchheister, New York City; Mrs. Ruth Trimble Chapin, New York City; H. Everest Clements, Rochester; Henry H. Collins, Jr., Bronxville; Lawrence I. Grinnell, Ithaca; Fred T. Hall, Buffalo; R. A. Herbert, New York City; Mrs. Herbert A. Hickman, Buffalo; Dr. Marguerite Kingsbury, Sunmount; Dr. Gordon M. Meade, Trudeau; James Monroe, Ray Brook; Kenneth D. Morrison, New York City; Bernard Nathan, Buffalo; Walter W. Naumburg, New York City; Kenneth C. Parkes, Ithaca; Mrs. J. Southgate Y. Hoyt, Ithaca; Mrs. Grace E. Barstow Murphy, New York City; Theodora Nelson, New York City; Bayard W. Read, Rye; Mrs. Kathleen Green Skelton, New York City; Mrs. Dayton Stoner, Albany; Sally Tate, New York City; Edward C. Ulrich, Buffalo; Jason A. Walker, Waterloo.

Ohio, 2—William C. Baker, Salem; Robert S. Smith, Cleveland.

Ontario, 18—O. E. Devitt, Toronto; Bertram A. Fauvel, Ottawa; Rowley Frith, Ottawa; James W. Groves, Ottawa; T. S. Hennessy, Ottawa; Mrs. L. Everett Jaquith, Toronto; W. H. Lanceley, Ottawa; Mrs. Louise de Kiriline Lawrence, Rutherglen; Mrs. Hoyes Lloyd, Ottawa; H. C. Lumsden, Tweed; Lucie McDougall, Port Credit; D. S. Miller, Toronto; Stuart S. Peters, Kingston; Mrs. James A. Selby, Ridgeville; Mrs. Doris Huestis Speirs, Pickering; J. Murray Speirs, Pickering; George M. Stirrett, Kingston; Frederick E. Warburton, Owen Sound.

Pennsylvania, 4—Phillips B. Street, Philadelphia; John E. Trainer, Allentown; Harold B. Wood, Harrisburg; Merrill Wood, State College.

Quebec, 19—Ruth A. Abbott, Senneville; J. P. Anglin, Quebec; Raymond Cayouette, Quebec; Albert C. Clattenburg, Jr., Montreal; James D. Cleghorn, Montreal; G. Harper Hall, Montreal; W. S. Hart, Montreal; Gladys Hibbard, Chambly Canton; Alfred W. B. Kelly, Montreal; Mrs. Gustav Langelier, Quebec; Louis Lemieux, Quebec; Ian A. McLaren, Montreal; George H. Montgomery, Jr., Westmount; Geoffrey Ommanney, Hudson Heights; W. H. Rawlings, Montreal; John W. Robinson, Montreal; Carroll C. Sait, Montreal; Mrs. L. M. Terrill, Westmount; Winifred E. Wilson, Montreal.

Rhode Island, 1—Roland C. Clement, Providence.

Texas, 1—Mrs. Anne Hinshaw Wing, College Station.

Vermont, 4—Elizabeth Ball, Rutland; Thomas H. Foster, Bennington; Harold B. Hitchcock, Middlebury; Marion Smith, Burlington.

West Virginia, 1—Ralph M. Edeburn, Huntington.

Wisconsin, 2—Carl B. Frister, Milwaukee; Mrs. Winnifred W. Smith, Two Rivers.

Venezuela, 1—Mrs. Kathleen D. Phelps, Caracas.

PUBLIC SESSIONS

Six public sessions were held, two on Tuesday at McGill University, two on Wednesday at the University of Montreal, and two on Thursday at the Botanical Garden. Four of these sessions were concerned entirely with the reading of papers. The session on Wednesday afternoon was devoted partly to papers and partly to a symposium and a round table discussion; the session on Thursday afternoon was occupied by the showing of motion pictures. An outline of the program is presented below. Titles marked with an asterisk were illustrated by lantern slides; those with two asterisks by motion pictures.

TUESDAY MORNING SESSION

Welcome by DR. F. CYRILL JAMES, Principal and Vice-Chancellor, McGill University.

Response on behalf of The American Ornithologists' Union.

Report on the Business Meetings; Announcements of the Results of Elections and the Brewster Memorial Award.

Announcements from the Local Committee on Arrangements.

*The Environment and Status of the Bermuda Petrel. ROBERT CUSHMAN MURPHY, American Museum of Natural History, New York City.

The Guiding Habit of the Honeyguides. HERBERT FRIEDMANN, United States National Museum, Washington, D. C.

The Projected Handbook of North American Birds. RALPH S. PALMER, New York State Museum, Albany.

An Introduction to the Wood Library of Ornithology, McGill University. ELIZABETH E. TERRILL, Montreal, Province of Quebec.

TUESDAY AFTERNOON SESSION

*Some Factors Influencing Body-size and Wing Proportions in the Evolution of Diving Birds. ROBERT W. STORER, University of Michigan Museum of Zoology, Ann Arbor.

*Avian Evolution in the Gulf of Guinea Islands. DEAN AMADON, American Museum of Natural History, New York City.

Exhibition of Specimens of White-crowned Sparrows from Certain Geographic Areas. W. E. CLYDE TODD, Carnegie Museum, Pittsburgh, Pennsylvania.

*Is the Southern Robin a Good Subspecies? J. MURRAY SPEIRS, University of Toronto, Ontario.

*The Subspecies of the Purple Grackle. CHARLES E. HUNTINGTON, Hamden, Connecticut.

*Hybridization in the Birds of Paradise of the Genus *Astrapia*. E. THOMAS GILLIARD, American Museum of Natural History, New York City.

*Family Relationships of New and Old World Grouse. LEONARD W. WING, Agricultural and Mechanical College of Texas, College Station.

WEDNESDAY MORNING SESSION

*Breeding Season and Molt in Passerines at Point Barrow, Alaska. FRANK A. PITELKA, University of California Museum of Vertebrate Zoology, Berkeley.

Experiments on the Relation between Wakefulness and the Gonadal Cycle. ALBERT WOLFSON, Northwestern University, Evanston, Illinois.

*Flights of Migrating Warblers to and from the Pacific Coast. ALDEN H. MILLER, University of California Museum of Vertebrate Zoology, Berkeley.

*A Comparative Study of the Wing Musculature in the Family Corvidae. GEORGE E. HUDSON, State College of Washington, Pullman.

*Environmental Factors Influencing the Flight of Homing Pigeons. HAROLD B. HITCHCOCK, Middlebury College, Middlebury, Vermont.

Hummingbird Flight—Some Speculations. CHARLES H. BLAKE, Massachusetts Institute of Technology, Cambridge.

*Seven Milliseconds in the Lives of Common Birds. ARTHUR A. ALLEN, Laboratory of Ornithology, Cornell University, Ithaca, New York.

Bradford Torrey, 1843–1912. WILLIAM C. BAKER, University of Pittsburgh, Pittsburgh, Pennsylvania.

Alexander Wilson's Trial. ELSA G. ALLEN, Laboratory of Ornithology, Cornell University, Ithaca, New York.

In Memoriam: Florence Merriam Bailey (read by title). PAUL H. OEHSER, Smithsonian Institution, Washington, D. C.

WEDNESDAY AFTERNOON SESSION

Seasonal Singing of the Eastern Meadowlark. ARETAS A. SAUNDERS, Canaan, Connecticut.

*Musical Elements of Bird Song. ANNE HINSHAW WING, College Station, Texas.

*Sound Recordings as a Means of Trapping Birds (with phonograph records). W. W. H. GUNN, Wildlife Research Station, Algonquin Park, Ontario.

Problems in Editing Bird-Sound Recordings (with phonograph records). P. P. KELLOGG, Laboratory of Ornithology, Cornell University, Ithaca, New York.

SYMPOSIUM

Purposes, Methods, and Results of Bird-Sound Recording in the United States, Canada, and Other Countries.

P. P. KELLOGG, Chairman

ROUND TABLE DISCUSSION

Bird Conservation Problems Currently Most in Need of Attention and What the A. O. U. Committee on Bird Protection Can Do about Them.

RICHARD H. POUGH, Chairman

THURSDAY MORNING SESSION

*How Many Kirtland's Warblers Are There? HAROLD F. MAYFIELD, Toledo, Ohio.

*Annals of a Kirtland's Warbler Colony. JOSSELYN VAN TYNE, University of Michigan Museum of Zoology, Ann Arbor.

*Notes on the Appalachian Population of the Swainson's Warbler. MAURICE BROOKS, West Virginia University, Morgantown.

*Appearance of Motor Coordination in Some Precocial Birds. MARGARET M. NICE, Chicago, Illinois.

The Development of a Conditioned Reflex in Birds. JOHN E. TRAINER, Muhlenberg College, Allentown, Pennsylvania.

*Interrelations between Clutch-size, Brood-size, and Prefledging Survival in Tree Swallows. RAYMOND A. PAYNTER, JR. Yale University, New Haven, Connecticut.

*Pair Formation in the Cliff Swallow. JOHN T. EMLEN, JR., University of Wisconsin, Madison.

*Does the Forehead Color of Female Pileated Woodpeckers Change with Age? SARAH E. HOYT, Etna, New York.

*The Heretofore Unknown Dance Ground of Sanford's Golden-crested Bower Bird. E. THOMAS GILLIARD, American Museum of Natural History, New York City.

*Vireos in the Province of Quebec. LEWIS MCI. TERRILL, Montreal, Province of Quebec.

*The Story of the Sun-Life Falcons. G. HARPER HALL, Montreal, Province of Quebec.

THURSDAY AFTERNOON SESSION

**The Rediscovery of the Takahe. ROBERT CUSHMAN MURPHY, American Museum of Natural History, New York City.

**Bird Oases in the West Indies. LAWRENCE I. GRINNELL, Ithaca, New York.
**The Life of the Ruby-throated Hummingbird. ARTHUR A. ALLEN, Laboratory of Ornithology, Cornell University, Ithaca, New York.
**Audubon's America. C. RUSSELL MASON, Massachusetts Audubon Society, Boston, Massachusetts.

OTHER EVENTS

On Monday evening, a dinner for the Fellows was given by the Local Committee in Salon B of the Mount Royal Hotel. Following this Dr. and Mrs. Van Tyne entertained members of the Union and their guests in Salon D.

The Annual Dinner on Wednesday evening in the Ball Room of the Mount Royal Hotel was attended by 228 members and guests. A vocal quartette, Le Quatuor Alouette, under the direction of Roger Filiatrault, entertained delightfully with French Canadian songs.

About 180 members and guests visited the Arctic Institute, Redpath Museum, and Wood Library of Ornithology at McGill University on Tuesday evening. Among the interesting exhibits at the Wood Library, which has the finest ornithological collection in Canada, was the unique Feather Book of Dionisio Minaggio, prepared in 1618, containing 151 pictures of birds made entirely of feathers.

On Thursday evening, about 150 members and guests gathered at the Montreal Museum of Fine Arts where Mr. Douglas Leechman of the National Museum of Canada showed slides of the Yukon country and a film, "The Loon's Necklace." At the conclusion of the program, members and guests viewed several special exhibits including one on bird photography by local members of the Union and another on birds and animals in art by the Museum of Fine Arts.

Seventy-three members and guests enjoyed a field trip on Friday morning to Ile au Heron Sanctuary, including St. Helen's Island, Laprairie Shore and Côte Ste. Catherine, with coffee at the Boulevard Hotel, Laprairie. Sixty-one species of birds were recorded. The next day, 27 members and guests visited Cap Tourmente below Quebec where they observed between 25,000 and 30,000 Snow Geese, and a few Blue Geese.

RESOLUTIONS

At the public session on Thursday afternoon, the following resolutions were passed:

Resolved, that we extend our thanks to W. S. Hart, W. H. Rawlings, Miss Ruth S. Abbott, Mr. and Mrs. L. McI. Terrill, G. Harper Hall, Louis Lemieux, W. R. B. Bertram, M. J. Dunbar, J. J. Rousseau, J. D. Cleghorn, and George H. Montgomery, Jr., Chairman of the Local

Committee on Arrangements, for their excellent work in planning efficiently and completing with great success this first Montreal Meeting of the American Ornithologists' Union.

Resolved, that we express the very grateful appreciation of the American Ornithologists' Union to the Province of Quebec Society for the Protection of Birds, and to members of McGill University, of the University of Montreal, and of the Montreal Botanical Garden for their kind hospitality, thoughtfulness, and generous efforts in arranging for our Sixty-ninth Stated Meeting.

TREASURER'S REPORT, FISCAL YEAR ENDING SEPTEMBER 15, 1951

INCOME TO ACTIVE FUND ACCOUNT

Dues		
Fellows	$ 251.00	
Members	651.50	
Associates	8,503.79	
		$ 9,406.29
Subscriptions		1,144.47
From Authors for Reprints		482.80
Advertising		48.75
Sale of Publications		610.09
Interest from		
General Endowment Fund		1,285.40
Ruthven Deane Fund		305.59
Educational Endowment Fund		
20 Student Members	$ 80.00	
Return 1950 Loan	.98	80.98
Contributions to Active Publications Fund		
Result of Endowment Committee	$ 919.00	
From other sources	1,537.00	2,456.00
		$15,820.37
Less returned checks		19.27
Total Income—1951		$15,801.10

SPECIAL FUNDS

Brewster Memorial Fund		
Interest from Investments	$ 475.82	
Returned Loan to Active Account		12.02
Cash Honorarium to Dr. Skutch		345.00
To General Endowment Fund Life Membership, Dr. Skutch		100.00
Postage, Medal to Dr. Skutch (1950 Medal was puchased in 1949)		.33
Balance in checking account		18.47
	$ 475.82	$ 475.82

Educational Endowment Fund		
Interest from Investments	$ 91.17	
To General Active Account (borrowed, 1950)		.98
Expense of Committee		3.54
To General Active Account, 20 Student Members		80.00
Balance in Checking Account		6.65
	$ 91.17	$ 91.17
Bird Protection Endowment Fund		
Balance from 1950	37.84	
International Union Bird Protection		40.00
Interest from Investments	62.75	
International Committee Bird Protection		5.00
Balance in Checking Account		55.59
	$ 100.59	$ 100.59
Endowment Fund		
Collected in 1948, to be invested	488.25	
Collected by Endowment Committee, 1951 Life Membership and partial payments	1,605.00	
Donations	456.50	
Collected by other sources		
Life Memberships and partial payments	625.00	
Donations to the Fund	129.50	
	$3,304.25	
To Investing Trustees		2,900.00
Collected during 1948, still to be invested		404.25
		$ 3,304.25
Special Fund for Publication of Fifth Edition of the Check-List of North American Birds, on deposit in the Savings Department of the United States National Bank, Omaha	$ 511.25	

DISBURSEMENTS

Manufacture and Distribution of 'The Auk'	$12,386.69
Reprints (October, 1950 to July, 1951, incl.)	826.75
Editor's Expenses	500.00
Secretary's Expenses	20.55
Treasurer's Expenses	602.19
Expense 1950 meeting, paid after meeting	320.75
Expense 1951 meeting, paid before meeting	207.00
Printing and mailing (addressograph plates, stationery, 1951 dues notices, etc.)	858.97
Purchase back issues and express on donated back issues	20.13
Bank charges and refunds	42.93
Committee on Nomination of Fellows and Members, Expenses	70.20
Membership Committee, Expenses	218.16
Endowment Committee, Expenses	247.45
Hand-book, Expenses	74.81

Committee on Biography, Expenses		25.99
Telephone and Telegraph		12.37
Total Expended, 1951		$16,434.94
Total Income, 1951	$15,801.10	
Balance from 1950	285.70	16,086.80
Expended over Active Account		$ 348.14
Balance in Endowment Fund	$ 404.25	
Balance in Educational Fund	6.65	
Balance in Bird Protection Fund	55.59	
Balance in Brewster Fund	18.47	
	$ 484.96	
Balance in Checking Account		$ 136.82

R. ALLYN MOSER, *Treasurer.*

OFFICERS, TRUSTEES, AND COMMITTEES OF THE AMERICAN ORNITHOLOGISTS' UNION

	Expiration of Term
JOSSELYN VAN TYNE, *President*	1952
ALDEN H. MILLER, *First Vice-President*	1952
LUDLOW GRISCOM, *Second Vice-President*	1952
ALBERT WOLFSON, *Secretary*	1952
R. ALLYN MOSER, *Treasurer*	1952
HARVEY I. FISHER, *Editor of 'The Auk'*	1952

ELECTIVE MEMBERS OF THE COUNCIL

IRA N. GABRIELSON	1952
ERNST MAYR	1952
A. W. SCHORGER	1952
W. J. BRECKENRIDGE	1953
GEORGE H. LOWERY, JR.	1953
L. L. SNYDER	1953
DEAN AMADON	1954
HARRISON F. LEWIS	1954
OLIN SEWALL PETTINGILL, JR.	1954
JEAN M. LINSDALE, *Cooper Ornithological Club Representative*	1952
BURT L. MONROE, *Wilson Ornithological Club Representative*	1952

Ex-Presidents

CHARLES F. BATCHELDER, 1905–8
ARTHUR CLEVELAND BENT, 1935–37
JAMES P. CHAPIN, 1939–42
HERBERT FRIEDMANN, 1937–39
HOYES LLOYD, 1945–48
ROBERT CUSHMAN MURPHY, 1948–50
JAMES L. PETERS, 1942–45
ALEXANDER WETMORE, 1926–29

INVESTING TRUSTEES

FREDERICK V. HEBARD, *Chairman*..... 1952
G. RUHLAND REBMANN, JR..... 1952
PHILLIPS B. STREET..... 1952

COMMITTEES

COMMITTEE ON FINANCE. R. Allyn Moser, *Chairman*. Stephen S. Gregory, Jr., Burt L. Monroe, Albert Wolfson, Josselyn Van Tyne.

COMMITTEE ON ENDOWMENT. Betty Carnes, (Mrs. Herbert E.) *Chairman*. Edward L. Chalif, Gordon M. Meade.

SPECIAL CANADIAN COMMITTEE. Hoyes Lloyd, *Chairman*. J. A. Munro, W. A. Squires.

COMMITTEE ON PUBLICATIONS. The Editor of 'The Auk,' *Chairman*. The President, the Secretary, the Treasurer, the Editor of 'The Ten-year Index to The Auk' (Charles K. Nichols), Ludlow Griscom.

COMMITTEE ON COMMUNICATIONS. Albert Wolfson, *Chairman*. John T. Emlen, Jr., Olin Sewall Pettingill, Jr.

EDITORIAL COMMITTEE. Harvey I. Fisher, *Chairman*. John T. Emlen, Jr., S. Charles Kendeigh, Robert W. Storer.

COMMITTEE ON THE BREWSTER MEMORIAL AWARD. Alden H. Miller, *Chairman*. David E. Davis, A. Starker Leopold, Ernst Mayr, James L. Peters.

COMMITTEE ON BIOGRAPHY. A. W. Schorger, *Chairman*. Jean Delacour, J. J. Hickey, Hildegarde Howard, T. S. Palmer, J. Murray Speirs.

COMMITTEE ON THE NOMINATION OF FELLOWS AND MEMBERS. L. L. SNYDER, *Chairman*. Frank A. Pitelka, Olin Sewall Pettingill, Jr.

COMMITTEE ON THE NOMINATION OF ASSOCIATES. Aaron M. Bagg, *Chairman*. William F. Rapp, Jr., *Vice-Chairman*. (Membership to be announced later.)

COMMITTEE ON CLASSIFICATION AND NOMENCLATURE OF NORTH AMERICAN BIRDS. Alexander Wetmore, *Chairman*. Herbert Friedmann, *Vice-Chairman*. Frederick C. Lincoln, Alden H. Miller, James L. Peters, Josselyn Van Tyne, John T. Zimmer.

COMMITTEE ON BIRD PROTECTION. Richard H. Pough, *Chairman*. (Membership to be announced later.)

COMMITTEE ON RESEARCH. Albert Wolfson, *Chairman*. Donald S. Farner, Herbert Friedmann, S. Charles Kendeigh, Ernst Mayr, Alden H. Miller, Margaret M. Nice.

COMMITTEE ON EDUCATION. William H. Behle, *Chairman*. Ian McT. Cowan, John T. Emlen, Jr., Joseph C. Howell, Charles G. Sibley.

LOCAL COMMITTEE ON ARRANGEMENTS FOR THE SEVENTIETH STATED MEETING. George H. Lowery, Jr., *Chairman*. William H. Baughn, Fred J. Buchmann, Robert J. Krebs, Robert B. Moore, Mrs. Robert B. Moore, Robert J. Newman, J. Harvey Roberts, O. W. Rosewall.

COMMITTEE ON ILLUSTRATIONS FOR 'THE AUK.' Milton B. Trautman, *Chairman*. David E. Davis, Cleveland P. Grant, Robert A. McCabe, Roger Tory Peterson, Charles W. Schwartz.

GENERAL NOTES

White Pelican from the Pleistocene of Oklahoma.—On July 24, 1950, Claude W. Hibbard collected two badly broken, incomplete fossil bones of a large bird (Univ. Mich. Mus. Paleo. No. 27551) in Beaver County, Oklahoma, near the west line of the SW ¼ of SW ¼ sec. 5, T. 5 N., R. 28 E. C. M. I am indebted to him for the opportunity to report on these and for a description of the locality in which they were found.

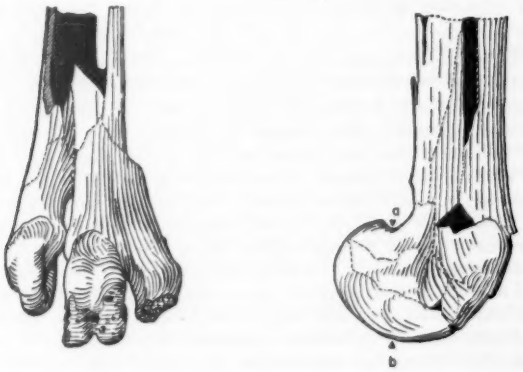


FIGURE 1. Bones of fossil White Pelican. *A*. Distal end of tarsometatarsus, anterior view. *B*. Distal end of tibiotarsus, medial view.

The bones are apparently those of a very large White Pelican, *Pelecanus erythrorhynchos*. They were found in the bank of an arroyo, about four feet above its bed, in a stream deposit of approximately "late middle Pleistocene" age. The exposure is in a dissected sink, and the deposit from which the bones were taken is stratigraphically above the Pearlette Ash member of the Crooked Creek formation. This ash is a well-known stratigraphic marker in the High Plains (*cf.* Hibbard, Contrib. Mus. Paleo. Univ. Mich., 7: 70, 1949). Part of the comparative material used in identification was lent by the University of California Museum of Vertebrate Zoology and by the University of Kansas Museum of Natural History through the courtesy of Alden H. Miller and Harrison B. Tordoff. Jane S. Mengel made the drawings.

The material (Fig. 1) consists of: a right tibiotarsus, including most of the distal one-third of the shaft, with the internal condyle nearly complete and the remainder of the distal articular surface lacking; a right tarsometatarsus with the distal end, including all three trochleae and the distal foramen, nearly intact but with the medial and anterior portions of the shaft missing. The shattered posterior surface of the shaft has been assembled as far as the distal end of the medial calcaneal ridge. The nomenclature of parts follows that of Howard (Univ. Calif. Publ. Zool., 32: 323–324, 1929). The bones were found in place, closely associated, in sandy silt and are apparently from a single individual.

TABLE 1

COMPARATIVE MEASUREMENTS OF WHITE PELICANS

Specimens	*Greatest breadth tarsometatarsus at distal end (across trochleae)*	*Vertical depth of internal condyle of tibiotarsus**
Fossil—U.M.M.P. No. 27551	26.1 mm.	17.2 mm.
Recent 3♂♂, 4 unsexed		
Mean, with standard error	23.63 ± 0.26	15.38 ± 0.23
Range	22.2 – 24.2	14.5 – 16.3
Standard deviation	0.70	0.60

*Taken just in front of internal ligamental prominence (between points a and b of Fig. 1, B.).

The elements agree well with the corresponding bones of seven specimens of the present-day White Pelican in every respect except size. They are generally larger and heavier throughout than the Recent material I have examined. The shafts, particularly that of the tibiotarsus, appear relatively heavier in the fossil. The distal foramen of the fossil tarsometatarsus is also relatively larger, but the Recent bones show considerable variability in this character. Table 1 suggests that this individual was as large, or perhaps slightly larger, than the largest examples of *erythrorhynchos* occurring today. Compton (Condor, 36: 167, 1934) has recorded a left femur of a White Pelican from the upper Pliocene or lower Pleistocene Manix beds of California. This bone was only 0.5 mm. longer than the average of four Recent specimens which he measured. However, the tendency for certain late Pliocene and Pleistocene forms to be larger than their living relatives, indicated recently for *Gymnogyps* by Fisher (Pacific Sci., 1: 227, 1947), and for *Colinus* by Tordoff (Condor, 53: 23–30, 1951), may prove true for the present form as well.

The total length of the fossil tarsometatarsus may be estimated, since, as already indicated, the specimen includes a recognizable point proximally, the distal end of the calcaneal ridge. While subject to a small error, this estimate gives a clearer idea of the large size of the bird. Assuming that the fossil and Recent pelicans have similar proportions, this bone must have been approximately 140 mm. in total length. The length of the tarsometatarsus in seven Recent individuals, by contrast, averages only 121 mm. (114–126), notwithstanding the fact that one of these was the largest of 18 specimens in the University of Kansas collection. Should further material become available, qualitative differences may be found indicating that this large Pleistocene pelican is specifically distinct from *P. erythrorhynchos*.

According to Wetmore (Smiths. Misc. Coll., 99: 10, 1940) the "recent form" has been recorded from the Pleistocene of Oregon and Nevada (the latter marked "?Pleistocene"), in addition to the California record mentioned above.

No other fossil birds from Oklahoma appear to have been recorded in the literature, save for a small duck reported by Hibbard (Univ. Kans. Sci. Bull., 26: 369, 1939). This specimen also came from Beaver County, near the Kansas line, though it was not specifically mentioned as an Oklahoma record.—ROBERT M. MENGEL, *University of Michigan Museum of Zoology, Ann Arbor, Michigan.*

The Identity of *Anser nigricans* Lawrence 1846.—It had seemed strange to us that the type of *Anser nigricans* Lawrence, a name so far used for the Pacific Black Brant, should be a bird collected in January, 1846, at Egg Harbor, New Jersey, on the Atlantic coast.

We have carefully examined the type in the American Museum of Natural History and another specimen, also from Lawrence's collection, taken in the same locality in the following March and mentioned by the author in his original description (Ann. Lyc. Nat. Hist. N. Y., 4: 171, pl. 12, 1846). Contrary to his assertion, both specimens are labelled as males and are adult. There is a third dark-bellied brant in the American Museum, collected at Cobb's Island, Virginia, in September, 1888, but it is in too poor a condition to be of much use for accurate identification. Inquiries have shown that no other dark-bellied brants from the Atlantic seaboard are in any museum in eastern United States.

We found that the type of *nigricans* and the second specimen differ from the Pacific Black Brants. They are generally browner; their underparts are medium gray, resembling closely in that feature the Eurasian *B. b. bernicla*, from which they are, however, distinguishable by having the white-spotted collar extending to the foreneck, and by the broader white borders of the feathers of the sides and flanks. They resemble in these two characteristics the Pacific Black Brants, but they differ from them in the decidedly lighter gray color of the lower breast and abdomen. This contrasts distinctly with the black upper part of the breast, while the two areas are almost concolorous, but yet different in shade, in the majority of adult Pacific birds, and completely so in a few adults, and in immatures.

The name *Branta bernicla nigricans* is, therefore, restricted to the Atlantic dark-bellied population, which leaves the Black Brants of northwestern America and eastern Siberia without a current name. The only one available is:

Branta bernicla orientalis

Tougarinov, A. J., Faune de l'URSS, Aves. (Acad. Sci. URSS, Moscou), 1 (4): 180, 1941: Polar Coast of Siberia from the Lena delta in the west, to Chukchi Peninsula in the east; New Siberian Islands, De Long Islands, and probably Wrangel Island.

Tougarinov writes (p. 368, translation): "The East Siberian Brant-Goose might be distinguished from birds of American origin by the following features, which prove to be very constant. The difference between the black crop and the blackish breast in the former is much better defined than in American birds, but less conspicuously than in *B. b. bernicla*. The dark color of breast and belly does not usually extend down to the vent, whereas in American Brant-Geese such is always the case. The Siberian Geese are moreover of a generally paler hue. There is no difference in size. *Branta bernicla nigricans* (Lawr.) occurs on the Anadyr, probably breeds on Chukchi Peninsula and possibly also on Wrangel Island." Examination of numerous specimens does not support Tougarinov's distinction between east Siberian and Anadyr-American Black Brants. It is incorrect to state that American birds have the dark color extending down to the vent, and the opposition between the black crop and the dusky breast is a question of either age or individual variation. It is possible, however, that lighter-bellied birds which are intergrades with *B. b. bernicla* occur in the Lena delta district. Therefore, the name *orientalis* is applicable to the Black Brants found on both sides of the Pacific. The confusion which has caused them to be called *nigricans* goes back to Cassin ('Illustr. Birds Calif., Texas, Oregon, British and Russian America,' pt. 2: 52–55, pl. 10, 1853). The plate represents accurately a Pacific Black Brant. No one since seems to have questioned the identity of the western birds with the Atlantic type.

This Atlantic *nigricans* was well-known by local wildfowlers in the last century, although it was already very scarce, as mentioned by several authors. It probably represents an almost extinct subspecies nesting farther south than the other and

therefore easily destroyed. In his excellent article "Migrations of the American Brant" (Auk, 54: 73–95, 1937), Harrison F. Lewis mentions early flights of dark birds locally called "les noirs" at the Bay of Seven Islands, Quebec. These dark birds have different flyways and probably nest in a particular region yet to be discovered, as breeding specimens collected by Sutton on Southampton Island are typical pale-bellied *hrota*.

We propose to recognize the following subspecies of *Branta bernicla:*
B. b. bernicla (Linné) Syst. Nat., ed. 10, 1: 129, 1758, Sweden.
B. b. hrota (O. F. Müller) Zool. Dan. Prodr., 1776: 14, Iceland.
B. b. nigricans (Lawrence) Ann. Lyc. Nat. Hist. N. Y., 4: 171, 1846, Egg Harbor, N. J.
B. b. orientalis Tougarinov, Faune de l'URSS, Aves, 1 (4): 180, 1941, Eastern Siberia.

The taxonomy of the brant geese has long been a subject of controversy. These circumpolar birds, breeding in the far north, remain completely uniform in size, proportions, and life habits throughout their entire range, but they vary in color. They vary principally in the color of the underparts below the black breast, in the width of the borders of the feathers on the sides and flanks, and in the extension of the white-spotted collar on the foreneck. The evidence is that of a continuous cline from pale to medium gray-bellied and dark-bellied ones from central arctic America, through Greenland, Iceland, arctic Europe, and Asia to eastern Siberia, with intergrading populations and intermediate individuals. But cases of mixing and blending between the dark-bellied populations of western arctic America and the pale-bellied ones to the east are few, when they meet, as reported by some observers, particularly in the Perry River area and on Prince Patrick Island (A. Gavin, Wilson Bull., 59: 195–203, 1947; H. C. Hanson, P. Scott, and P. Queneau, 'Waterfowl Populations and Breed. Cond., Summer 1949,' Spec. Sci. Rep. Wildlife, Wash., 2: 225–228, 1949; and C. O. Handley, Jr., Wilson Bull., 62: 128–132, 1950). It does not seem, however, that two distinct species are involved. We are rather facing here one of the several instances in which two subspecies of the same species, recently coming again into contact owing to changes in life conditions, are wont to mingle. Furthermore, the colonial habits and close family ties of the geese tend to insure inbreeding and to delay the mixing of populations. It is possible that the plumage differences in the present case are due to alterations in a single gene.

The nominal form, *B. b. bernicla*, with a medium gray belly, narrow white fringes to the flank feathers, and a spotted-white collar interrupted in front, breeds in arctic eastern Russia, western Siberia, and the islands to the north, from the south of Nova Zembla to the mouth of the Khatanga River. The pale-bellied form, *B. b. hrota*, breeds in the north of Nova Zembla, Franz Joseph Land, Spitzbergen, Greenland, and arctic Canada, west to the Perry River and St. Patrick Island, where it meets *orientalis*, the dark-bellied form of western North America and eastern Siberia. —Jean Delacour and John T. Zimmer, *American Museum of Natural History, New York.*

Records of the Black Pigeon Hawk, *Falco columbarius suckleyi*, in Utah.— The winter range of this race as given by Friedmann (U. S. Natl. Mus. Bull. 50 (11): 713, 1950), includes the states of Washington, Oregon, California as far south as Los Angeles County, Colorado, New Mexico, and Wisconsin. To the present time this falcon has not been reported from the following western states: Idaho, Nevada, Arizona, Utah, Wyoming, and Montana.

Two records from Utah in the past two years suggest that, during the winter months, this falcon ranges more widely in the western states than heretofore thought. Further collecting may substantiate this supposition. One female with a broken

wing was found by Robert J. Erwin at Plymouth, Boxelder County, Utah, in February, 1948. The second specimen, a male, killed itself by flying against a window pane in the business district of Ogden, Weber County, Utah, in March, 1950. Both of these specimens were identified as *Falco columbarius suckleyi* Ridgway by Dr. H. Friedmann and are in the Weber College Museum of Zoology, Ogden, Utah.—RICHARD D. PORTER AND HOWARD KNIGHT, *Weber College, Ogden, Utah.*

Sparrow Hawk, *Falco sparverius*, Eats Bread.—For the first five days of April, 1950, I was able to observe a female Sparrow Hawk in the grounds of a hospital in Toronto, Ontario. Since cold weather inhibited the movements of insects etc. most of the time, and small birds seemed to avoid the vicinity of the hawk, I was puzzled by an apparent lack of food for it.

Feral Pigeons, *Columba livia*, fed in numbers on bread thrown to them by patients. On the morning of April 1, the hawk dropped from her perch and approached two such pigeons in a swift horizontal glide. The pigeons took flight but the falcon flew directly to the bread, on which she alighted. Holding it with her feet, she tore small pieces of bread off the crust, raising her head after each bite and usually throwing the bread to one side. Within a few minutes she had reduced the bread to crumbs, apparently without swallowing any, and then flew to another perch.

In the next 24 hours the hawk repeated this performance several times, never attacking the pigeons but never approaching bread unless it was already being eaten by pigeons. Like the pigeons, she wasted much of the food as crumbs, by shaking large pieces violently and flinging them to one side.

On the afternoon of the second day, the Sparrow Hawk began carrying bread to her perch, in her beak or feet. She still lost much of it as crumbs, but definitely ate some. Late in the afternoon, she seized a piece as soon as it was thrown from a window. From that time, she lost her apparent dependence on pigeons to draw her attention to bread.

On the third day, the hawk no longer pounced on the bread, as on a grasshopper, but spent much time running about on the ground like a Robin, carrying bread in her beak to a perch. The fourth day was warm and rainy, and she used exactly the same technique to capture rained-out earthworms. April 5, the last day of my observations, was cold again, and the hawk returned to a diet of bread.—FREDERICK E. WARBURTON, *Owen Sound, Ontario, Canada.*

Communal Roosting of American Rough-legged Hawks, *Buteo lagopus sancti-johannis*.—South of Palatine, in northwestern Cook County, Illinois, is a stand of five old apple trees left unmolested in the midst of otherwise cultivated fields. During January and February, 1950, I drove by this stand of trees every evening around five o'clock. At this season it was about the time of dusk when motorists begin turning on their car lights. I observed the Rough-legged Hawks on the evening of January 24. One hawk was in the tree and one was approaching. As I watched, three more hawks alighted and a sixth drifted by. After a while three left and flew off across the darkening fields. Finally they came back one by one and settled in the trees. The sixth had not returned by the time I left.

My journal for January 30 records four hawks on the roost when I arrived. Two flew off and one returned, leaving three at the time I left. On January 31, a clear day, I found hawks on the roost early. By the time I left eight were there. February 2 was clear and I stopped by earlier to look for hawk pellets. Crows were congregating in a plowed field, and I saw three of the hawks perched here and there on fence posts at some distance from the trees, waiting, I suppose, until the Crows left.

Upon my arrival on February 3 three hawks were on the roost and two off at a distance on fence posts. One by one, they deserted the roost and congregated in trees near a farm house about a third of a mile away. When I left there were seven hawks on the new roost and one still hunting over the fields. On February 14, the day after the worst glaze-ice storm in 15 years in the Chicago region, I stopped at the hawk roost and found one hawk in the trees and a pile of broken branches on the ground beneath. I imagine the previous night must have been very bad for them with branches breaking off around them and perhaps from under them. Thereafter the roost was deserted.

I obtained from beneath the roost three large, irregularly shaped pellets and four smaller ones similar to those of the Long-eared Owl. These were wrapped in fur, with the exception of one of the largest ones which was twice the size of the others. The pellets, as analyzed by William H. Stickel of the U. S. Fish and Wildlife Service, consisted chiefly of hair and bones of meadow mice, *Microtus pennsylvanicus*. The largest pellet consisted of a piece of cotton wadding, a small piece of thread, a fragment of yellow leg skin and some bones (these may have come from a chicken leg), fragments of corn, corn cob, oats, barley, and caraway seeds; also some grass and other vegetable matter. The supposition is that these materials were ingested as carrion.—F. J. Freeman, *Itasca, Illinois*.

Food of a Family of Great Horned Owls, *Bubo virginianus*, in Florida.—On the Welaka Game Reserve, Messers. William McLane, Joseph Moore, and Paul Pearson found a nest of Great Horned Owls. A nestling bird about four weeks old was removed from the nest and tethered to a nearby tree on January 16, 1949, on which date nest scraps and whole pellets were collected. At intervals, pellets were collected from the young bird and some were gathered in the near vicinity. On

Prey Items of the Great Horned Owl in Florida

Species	*Pellets*	*Minimum no. individuals*
Common Mole, *Scalopus aquaticus*	1	1
Little Brown Bat, *Myotis austroriparius*	1	1
Rabbit, *Sylvilagus* sp.	8	3
Pocket Gopher, *Geomys tuza*	5	4
Cotton Rat, *Sigmodon hispidus*	5	5
Pied-billed Grebe, *Podilymbus podiceps*	1*	2
Least Bittern, *Ixobrychus exilis*	1	1
Greater Scaup, *Aythya marila*	4	2
Lesser Scaup, *Aythya affinis*	9	5
Florida Gallinule, *Gallinula chloropus*	2*	3
American Coot, *Fulica americana*	55*	26
Flicker, *Colaptes auratus*	*	1
Robin, *Turdus migratorius*	1	1
Snake, undetermined	4	2
Lizard, undetermined	1	1
Grasshopper, *Schistocerca* sp.	1	1
Grasshopper, *Stilpnochlora coulonia*	1	1

* Fragments of prey also found in nest.

April 25, 100 days later, the four-month-old owl broke loose. Eighty-eight pellets had been accumulated, 24 from adult birds.

The nest tree was situated in a flatwoods comprised of turkey oak and long leaf pine. This area and the mammals therein are described by Moore (Journ. Mamm., 27: 49–59, 1946). Less than a quarter-mile to the northeast is a flatwoods pond upon which a large population of Coot (*Fulica americana*), Florida Gallinule (*Gallinula chloropus*), and Lesser Scaup (*Aythya affinis*) resided during the winter and early spring. Directly westward are two other smaller ponds at an equal distance. The St. Johns River flows about one mile from the nest tree. The state fish hatchery ponds lie between the river and the nest. These latter are frequented by many species of water-fowl. These thickly populated habitats were well within the daily foraging radius of this owl, as mentioned by Errington (Condor, 34: 75–86, 1932). The only human dwellings in the locality were adjacent to the hatchery ponds.

A qualitative analysis of each pellet was made to determine the animals preyed upon, and which of these formed the most numerous item of the owl's diet. Eight species of birds were taken and five or six mammals (*Sylvilagus* identified to genus only). Reptiles formed a part of the adult food. Two snakes and one lizard were found but could not be identified from the occasional vertebrae present in the pellet remains. The grasshoppers were probably caught by the tethered bird and formed but a minor component of the diet.

I wish to express my appreciation to Dr. Pierce Brodkorb, Dr. H. B. Sherman, Dr. Irving J. Cantrall, and Mr. Paul Pearson for aid in the identification of the prey species.—Bartley J. Burns, *Department of Biology, University of Florida, Gainesville, Florida.*

Blue Jay, *Cyanocitta cristata*, "Anting" with Burning Cigarettes.—A fledgling Blue Jay, brought alive to the Dallas Museum of Natural History in late May of 1949, was kept captive until its death some six months later. During this period the bird was not confined in a cage, but was given the freedom of a large workroom where it quickly became an entertaining if somewhat "mischievous" pet.

The bird early evinced—as opportunity was afforded it—the unusual behavior trait of dressing the feathers of its wings with the lighted and still burning tip of a cigarette. McAtee (Auk, 55: 98–105, 1938) in his summary of the subject of "Anting" has classified recorded observations of birds dressing their plumage with various animate and inanimate objects other than ants, as "Cognate (?) phenomena, not anting."; under this heading he cites an observation by Heinroth (Journ. für. Orn., 59: 172, 1911) in which a tame Magpie "eagerly rubbed its feathers with cigar stumps." As it is not specified that the cigar stumps were lighted and burning, the inference is that they were not.

In the present instance, the bird showed no particular interest in an unlighted cigarette other than occasionally to tear one apart, as it also would other comparable objects; but if a lighted one were left unguarded within its reach or purposely tossed to it on the floor, almost invariably its responses were immediate and positive. It would swoop down and seize the cigarette, which, if the "butt" were a short one, would be taken lengthwise in the bill by the unlighted end. If it were long, it would be held diagonally, with the lighted end away from the bird. Then, partially elevating and carrying forward the wings, the jay would bend its head and with rapidity and vigor rub the burning tip of the cigarette alternately along the under surface of the primaries of first one wing and then the other. In the meantime, it would squat on the length of the tarsi with the tail brought forward and to one side, in which position it appeared to be more or less sitting on its tail. The intensity of the

rubbing action was such that the bird not infrequently lost its balance and fell to its side, but this did not inhibit the continuity of the rubbing which continued until all of the burning tobacco had been abraded from the cigarette's tip. When this had been accomplished the act terminated. The entire performance, which was repeated many times, seldom lasted over 10 or 12 seconds and was executed with a rapidity which made observation difficult.—F. W. MILLER, *Dallas Museum of Natural History, Dallas, Texas.*

Display of Black-capped Chickadee, *Parus atricapillus*.—A Black-capped Chickadee entered a government sparrow trap at my banding station in Madison, Wis., about 4:45 p. m. on April 25, 1951. It was a color-banded bird, originally ringed in October, 1950. As I remained near the trap verifying the color combination, another chickadee began scolding about 12 feet away. Seeing that the latter bird was also color-banded, I began "squeaking" in an effort to bring it close enough to see the color-bands. It proved to be a bird first banded in September, 1949. For several minutes it remained within 6 to 12 feet of me, scolding intermittently, and going through the following display. With feathers puffed out and tail spread, both wings were raised high over the head and then lowered but kept extended away from the body. This was slowly repeated in a circular motion at the rate of about one revolution per second; at the same time the bird tipped forward on the branch as though losing its balance. When almost upside down, with wings still moving in a circular motion, it would fly to another nearby branch and repeat the performance. Upon liberating the trapped bird, the one displaying immediately returned to normal size and posture, gave a '*chick-a-dee-dee*' call, and joined the bird that had just been released. The following day the same two birds were seen feeding together and giving the low, soft notes associated with a pair.

Both the wing-waving and tipping behavior have been described among chickadees by Odum and E. R. Pettingill. Apparently, however, the display consisted only of wing-waving, or only of tipping, not of both simultaneously. In one instance, a young Black-capped Chickadee was captured and the parents, scolding, flew toward the intruder; they raised both wings over the back and flapped them slowly back and forth, with the head held straight out and moved slowly from side to side (Odum, Auk, 54 (4): 531). In another case, the display was provoked by a red squirrel approaching the nest of an Acadian Chickadee, *Parus hudsonicus*. One of the adults tipped over backward on a branch until it was upside down with "wings fluttering helplessly"; it then flew to another branch and appeared to fall over sidewise (E. R. Pettingill, Bird-Lore, 39 (4): 280).—MARGARET B. HICKEY, *13A Eagle Heights, Madison 5, Wisconsin.*

Starlings, *Sturnus vulgaris*, Catching Insects on the Wing.—Observations made chiefly in Baltimore from 1936 through 1950 show it to be a fairly common thing for the Starling to hawk insects by more or less prolonged, circuitous flights in something the manner of swifts or swallows. This agrees with Tucker's findings in Europe (Auk, 67: 243, 1950).

My notebooks for the years 1936 to 1950 contain 43 observations of such hawking, made on 37 days; the dates range from March 14 to November 18; most fall between August 21 and October 20. I have 29 observations made on 27 days of Starlings hawking out from trees or roofs and returning to their perches with single insects, in the flycatcher manner that Hodges (Auk, 67: 242–243, 1950) regards as the more common of the two; these dates range from March 10 to November 23. On 11 days, both methods of feeding were being used simultaneously by different members of the same Starling flocks.

The sustained type of hawking was seen not only in the Starlings' usual daytime feeding areas, but over their summer roosting places (I am not confusing it, here, with social flying) and on several occasions along the course of their flight to a roost. Selections from my notes are:

October 17, 1938, Baltimore. At 4:45 p. m., Starlings were hawking spectacularly, in Chimney Swift fashion and usually in considerable numbers—about 10 in sight at a time—over a chiefly wooded area. Flying at altitudes of perhaps 70 to 200 feet, and widely scattered, the birds glided, made sudden half-spins sideways, and climbed almost vertically for short distances.

October 9, 1939, Lancaster, Pennsylvania. At 4:53 p. m., a number of Starlings paused and made hawking swerves during a long flight across farming country, presumably to their roost. At noon a number had been hawking over a meadow, and at 12:45 some were hawking widely above an orchard.

October 6, 1940, Baltimore. This afternoon the first Chimney Swifts, *Chaetura pelagica*, since October 2 appeared and spent 40 minutes or more hawking about, and less than a minute after I saw the first of these, Starlings began hawking over the same territory and continued pretty steadily for 30 minutes. There is a strong suggestion that the Starlings' hawking today was partly imitative, for not only did it start suddenly when the swifts appeared, but it was stopped and resumed three times in close correspondence with periodic disappearances and reappearances of the swifts.

August 24, 1949. Between 6:10 and 6:22 p. m., bands of Starlings flying to a roost near my home occasionally hawked briefly on their way, and some that seemed to have paused in outlying trees occasionally flew up and hawked briefly.—HERVEY BRACKBILL, *4608 Springdale Avenue, Baltimore 7, Maryland.*

Starlings, *Sturnus vulgaris*, Eating Monarch Butterflies.—It is generally believed that butterflies of the genus *Danaus* are "protected" by chemical secretions which are distasteful to birds and to predaceous insects. On this assumption is based the theory that certain butterflies of the genus *Basilarchia* "mimic" members of the genus *Danaus*. Holland (The Butterfly Book, 1902: 84) calls attention to the close resemblance between the monarch butterfly, *Danaus plexippus* Linnaeus, and the viceroy, *Basilarchia archippus* Cramer. He assumes that the viceroy mimics the monarch for protective reasons.

On several occasions during August, 1950, I saw Starlings pursuing monarch butterflies. On August 17 I watched a Starling capture and eat a monarch, and on August 19 I witnessed two such captures. In each case I examined the wings of the eaten butterfly to make certain of the identification.

The summer of 1950 in West Virginia was unusually cool, and many insects were notably scarce. Broods of certain species appeared three to five weeks later than average, and some broods did not appear at all. Butterflies of all species were conspicuous by their scarcity until late in August. It may be that birds turned to butterflies of any available species for food, or it may be that so hardy and omnivorous a bird as the Starling is not effectively repelled by the chemical protection which monarch butterflies are supposed to enjoy.—MAURICE BROOKS, *West Virginia University, Morgantown, West Virginia.*

Nesting of Bell's Vireo, *Vireo bellii*, in Louisiana.—Breeding of Bell's Vireo in Louisiana has been indicated for some time, but prior to 1950 no nesting record had been established. Oberholser (Bird Life of Louisiana, 1938: 503) considered the species a "very rare and local summer resident" on the basis of one bird observed by him in June and three spring records by Lowery. Lowery (Aud. Field Notes, 3:

213, 1949) recorded my observations near Robson, southeast of Shreveport, on May 14, 1949, as well as a singing bird near the same place on May 2, 1948 (incorrectly published as May 12).

On June 11, 1950, I heard two birds of this species singing in the trees on a batture on the Red River at the community of Dixie Gardens, just outside the southeastern city limits of Shreveport. This batture is covered with sand bar willow, *Salix interior*, with a scattering of cottonwood, *Populus deltoides*. Concentrating on one bird, I soon located its nest, which was situated about 4.5 feet above the ground in marsh elder, *Baccharis halimifolia*, and contained four eggs. On June 18, I attempted to locate the nest of the second singing bird. It was found about 25 yards from the first nest, also in marsh elder and at about the same distance above the ground. It contained four eggs. The first nest was subsequently visited by other observers, as well as myself, until after the young were on the wing. The abandoned nest was collected and is now in the Museum of Zoology, Louisiana State University, along with color slides taken by Dale Hamilton.

Three other singing males of this species were observed regularly during June. One of these, located in willows along the bank of the river a short distance below the batture, was first noted by Ambrose Daigre on May 28. The other two, in willows on a batture about one mile west of Curtis, almost directly across the river, were observed by Daigre, Hamilton, and me on June 4 in an area where I first heard one individual on May 6.

The few individuals of this species which have been observed in this vicinity all show a proclivity for willows. It is interesting to note, however, that neither of the nests was situated in willow, despite its abundance in the area.

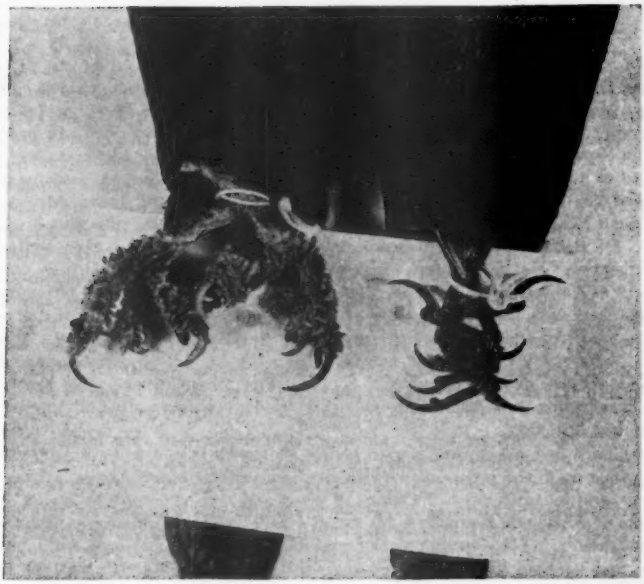
Bent (U. S. Natl. Mus. Bull. 197: 254, 1950) states that where the range of this species overlaps that of the White-eyed Vireo, *Vireo griseus*, "they are often found in similar haunts or in the same thickets." The White-eyed Vireo is a common summer resident in the vicinity of Shreveport. However, to the present time I have neither seen nor heard it in any of the areas where I have found the Bell's Vireo.

I wish to thank Dr. George H. Lowery, Jr., for his suggestions and for identification of the marsh elder.—HORACE H. JETER, *4534 Fairfield Avenue, Shreveport, Louisiana.*

Number of Contour Feathers on a Cowbird, *Molothrus ater*.—With the aid of several students, I counted the feathers on a male Cowbird taken February 21, 1948, at College Station, Texas. The feathers forward of the junction of the head and neck were counted separately from the body itself. There were 1246 feathers (mostly very small ones) on the head and 3051 on the body for a total of 4297.—LEONARD W. WING, *Texas A. and M. College, College Station, Texas.*

"Scaly Leg" (Cnemidocoptiasis) in the Red-winged Blackbird, *Agelaius phoeniceus*.—A male Red-winged Blackbird trapped in Arkansas County, Arkansas, November 30, 1949, was observed to have a severe infection of the feet and legs. The infection was later diagnosed as "scaly leg," a condition that was caused by a small mite, *Cnemidocoptes* Fürstenberg, 1870, burrowing into the skin underneath the scales on the leg. The long, fringe-like projections on the infected area, as seen in the photograph are the result of an exudate from the inflammation. The exudate had become hardened and actually replaced the scales.

According to the junior author the bird's activity was normal. There was also evidence from the manner in which the foot pads were worn that the infection had



MALE RED-WINGED BLACKBIRD, November 30, 1949. Sec. 33, R5W, T3S, Arkansas Co., Arkansas. Trapped by the junior author while he was an employee of the Fish and Wildlife Service. Normal male on the right.

not interfered with the blackbird's perching.—JOHN R. OLIVE, *Department of Zoology, Colorado A. & M. College* and VINCENT SCHULTZ, *Tennessee Game and Fish Commission, Nashville, Tennessee.*

RECENT LITERATURE

The Hawaiian Honeycreepers (Aves, Drepaniidae).—DEAN AMADON. Bull. Amer. Mus. Nat. Hist., 95 (4): 151–262, text-figs. 1–23, pls. 9–15, tables 1–15. December 11, 1950. Price, $1.75.—In the Hawaiian honeycreepers, Dean Amadon saw an opportunity to apply current ideas of evolution to a group of birds long considered to present one of the striking examples of avian evolutionary radiation. He enjoyed first-hand study of the large Rothschild collection of Drepaniidae in the American Museum of Natural History and the Bishop Museum collection in Honolulu. He also had a chance to see certain of the honeycreepers in their native environment on Oahu and Hawaii, where on the latter island he and I participated in a diligent field trip together. In his monograph he has presented a body of previously unpublished data consisting mainly of measurements and of descriptions of molt. He has reviewed and added to our stock of data on plumages and anatomy. For the parts of his study dealing with natural history, he has placed extensive and fully justified reliance on the writings of R. C. L. Perkins, primarily, and other naturalists who in collecting these birds in the 1890's recorded much information on distribution, foods, and behavior.

Amadon's first major task was to review the entire family to formulate his own judgments as to the proper systematic arrangement of the subfamilies, genera, and species, and to decide upon the status of the closely related differentiates. A sound feature of Amadon's approach is his use of a wide variety of criteria in formulating his judgments. These include data pertaining to structure (external and internal), color and pattern, distribution, feeding habits, habitat, behavior, and any other items he could find. Thereby he avoided and corrected errors made by some of his predecessors in attaching too much importance to particular criteria, such as structure alone.

A genus of broad nature as delimited by Amadon is *Loxops* (combined from approximately six genera). His treatment of these confusing forms is quite successful; however, some parts of the genus are better known and better handled than others. To me the least satisfactory decision he made here is the combining of several creeper-like members into the single species *maculata*. There are arguments for this action, however, including their "replacing nature" from island to island and their similarity in size and shape of bill. Against it are the rather great differences in coloration, usually expressed in the presence or absence of secondary sexual differences in plumage, and differences in behavior, voice, and feeding traits. Knowing the Maui and Hawaii "races" well in the field, I constantly felt that these were distinctly different birds; whereas, by contrast, in the case of the Maui and Hawaii races of *L. virens* I was strongly impressed with their essential similarity, if not identity, on behavioral grounds. I cannot visualize the Maui and Hawaii races of *L. maculata* interbreeding should one of them become transported to the other island, but of course this is a risky surmise, the validity of which remains to be established. Perhaps a special effort should be made to test the forms of the species *maculata* by breeding experiments to see if they will interbreed in captivity readily, unwillingly, or not at all, and to expose any intersterility or other phenomena associated with sexual isolation. The current arrangement as far as this species is concerned should not be viewed with finality, since several races are still extant and fairly common today in the Hawaiian forests, leaving a real possibility that some investigator may go after and obtain data which will elucidate the nature of evolution within this "species."

For the most part Amadon has treated his data with great care, but occasionally he disregards fine distinctions, as when he states that *Loxops maculata mana* is "very similar in all details of coloration to *L. v. virens* of the same island" (p. 165). Had he made this of general import rather than specifying "all details," it would have been a safe statement. Actually there are easily discernible and well-known differences in coloration of the lores, face, throat and underparts, and back such that it would be difficult or impossible to mistake one of the typical bright yellowish male *virens* for a *mana* of any age or sex.

Although I found it hard to accept his conception of the genus *Psittirostra* (combined from five genera and six species), I now recognize its convenience. In our present state of fragmentary knowledge it does no violence to the finch-billed group to think of it as a monophyletic assemblage of well-differentiated species. It remains as an unsatisfactory feature of his arrangement that any known interrelations among the several members of this group have been obscured by such lumping; had Amadon found some basis for the use of subgenera this difficulty might have been surmounted. That he did not reflects the baffling nature of the assemblage of characters possessed by this group. Additional knowledge will be required of anatomy and behavior, as well as the history of the group to understand the interrelations of the finch-billed drepaniids.

It would be of great help, not only in the two instances just discussed, but in the entire family, to know much more than we do about the physiology of color and pattern and their genetic control. Amadon makes the likely suggestion that color changes are easily accomplished in the Drepaniidae. He seems to be right, judging from the fact that no adaptive basis has been perceived for the many color changes together with the frequency of such changes and the great range of colors resulting (greens, grays, yellows, oranges, reds, browns, black). Amadon further suggests that since reds are found in both of the subfamilies of this group it must have been a basic and typical color in the ancestral stock at least prior to the time of the divergence resulting in the present-day subfamilial lines. This may be questioned, however, on the basis that the bright yellows-oranges-reds of the Psittirostrinae are primarily associated with the male sex (though exceptions occur), whereas in the Drepaniinae these colors are, so far as known, always associated with both sexes. Could this indicate a basic difference in the physiology of color control between these two subfamilies that would invalidate the thought that similarity of color reveals an identical trait common to the two lines? May this not show that the reds here are in fact not of the same character in the two groups?

An outstanding handicap to Amadon in his work on measurements was the small series of specimens available for each discreet population he studied. The organization of the work and the statistical methods employed seem very competent, yet the reader becomes discouraged at finding it pointed out so frequently that some certain suggestion is based on inadequate evidence and may be invalid because of possible sampling error. Of course, the author is right in keeping the reader reminded of this, but it makes the latter wonder if the data were adequate in the first instance for such an intensive statistical analysis. Probably much of this work will have to stand for lack of additional material of the rarer and extinct species, but other parts of it are subject to verification in the future through the analysis of more specimens, either those now in collections not used by Amadon or those which may be obtained by future workers in the field. In this chapter Amadon makes a wealth of suggestive interpretations which contribute toward our understanding as to how such relationships as tail-length and wing-length vary among adaptive feeding types which ap-

peared in this family. These serve to whet the mental appetite for a more thorough knowledge of the correlation between observable anatomical trends and behavioral changes.

Amadon has carried through a more extensive analysis of molt in the drepaniids than has previously been published. For this work he, of course, used the same assemblage of museum skins employed in the rest of his work. The larger and older collections of the Hawaiian honeycreepers were made by professional collectors who undertook expeditions to particular localities, collected for a few weeks and then moved on to some other locality where they repeated the procedure. The seeking out of rare birds was a primary objective in this work, and much time was given to special trips to promising localities for the species of more local distribution, where all individuals encountered were at once collected. Series for given species were amassed, therefore, which tended to represent adequately only a few months of the year. This was partly offset by the adding of smaller series of birds collected from various additional sources. It apparently was not possible to pick out adequate series to demonstrate fully the manner in which the rather lengthy molt of the drepaniids progressed. This meant that for the rarer species Amadon had to make difficult deductions from only scattered specimens of the kind he needed, while even for the species for which he studied the most specimens in molt (*e. g., Vestiaria coccinea* and *Himatione sanguinea*), I should judge he had poor representation for some times of the year for certain age and sex groups. Notwithstanding these difficulties, he made many shrewd deductions about the nature of molt among most members of the two subfamilies, and he uncovered evidence to suggest that differences in the timing of molt may have developed within the family.

The scantiness of the factual background with which he had to deal has led to many disputable assertions. The basis for my own views is an independent analysis of molt (as yet unpublished) in three species of drepaniids, *Vestiaria coccinea* (54 specimens), *Himatione sanguinea* (113 specimens), and *Loxops v. virens* (113 specimens). These I collected evenly over all the months of the year on the Island of Hawaii. For the sake of the record, I shall indicate a number of the disagreements between his data and conclusions and mine.

In discussing the wing and tail quills in postjuvenal molt of *Vestiaria* he explains, "By the time the body plumage is molting, the juvenal wing and tail quills have become somewhat worn and brownish. They are not molted as a rule until after the body plumage has been nearly or quite replaced. In three specimens that still have a few immature feathers about the nape (February 18, March 26) the wing and tail feathers are beginning to be replaced" (page 193). I found in postjuvenal molt in *V. coccinea* that wing quills (primaries and secondaries) initiated their molt early in the process, in fact when the general body molt was just starting, rather than after the body plumage had been nearly or quite replaced. Such wing quill molt was always accomplished by September in my series (the latest was molting secondaries 7 and 9, on September 12). Any wing or body molt which I was able to detect after December appeared to be of adventitious character, a phenomenon not at all uncommon in birds in which feather follicles are injured or perhaps stimulated in some other way. I strongly suspect that some unusual cause operated to induce untimely molt in the wings of the three birds Amadon mentions, as such an occurrence is completely unlike the postjuvenal wing molt in my series of 22 first-year *Vestiaria*, 15 of which were actually undergoing postjuvenal molt. I was not able to detect any wing molt in six birds continuing postjuvenal molt later in the year than September. Also, there was no evidence of continued molt in five first-year birds collected be-

tween January 22 and July 4. All of the latter had undergone postjuvenal molt the preceding fall and retained some juvenal feathers either of body or wing type.

Continuing his discussion of postjuvenal molt in *Vestiaria*, Amadon deduces that, "Perhaps some specimens with fully adult body plumage retain juvenal wing and tail quills. The difficulty of separating worn adults from immatures by the shape of the primaries makes it impossible to prove this from specimens" (page 193). I can definitely state that some specimens with fully adult body plumage do retain some juvenal wing quills. A specimen collected March 3 showed such adult characters of plumage as red-edged greater secondary coverts (occasionally tan-edged juvenal greater secondary coverts persist after completion of postjuvenal molt), and no yellowish body feathers of juvenal character remaining. In this specimen all wing quills were of adult type, except secondaries 4 and 5 on both wings. Each of these secondaries was clearly lighter in hue and shorter than the other group, indicating they were retained juvenal quills. This appears to prove the case without the problem of distinguishing between worn adult and juvenal quills, since here we have a contrast between relatively fresh adult and worn juvenal quills. Normal retention of a varying number of remiges and greater upper secondary wing coverts was seen in other cases where wing molt had already ceased though body molt was not yet completed. This is a condition frequently observed in specimens collected in October and November.

Amadon believes it the normal situation that wing quill replacement is actually complete in postjuvenal molt. Therefore, the statement quoted in the paragraph above shows that he held some reservations to the effect that occasionally an individual retained juvenal quills. My material led me to believe that very frequently all juvenal remiges are retained (something less than half of the individuals I examined in postjuvenal molt), that more frequently some are molted, and perhaps in a not very large proportion of the population they may be entirely replaced, though this latter I could not prove with my material, as such individuals would have been indistinguishable to me from older adults. Were the latter situation more general than I supposed, then the older age groups must have had extremely small representation in my total sample, and this is unlikely. I feel Amadon's following statement needs modification: "The post-juvenal molt of *Vestiaria* as just described produces a plumage fully adult in all details. In addition to the complete change in color from yellowish green to scarlet, the rounded juvenal primaries are replaced by the truncate ones of adults . . ." (p. 193), since it appears that certain juvenal feathers are usually not replaced until the first adult fall molt.

It is again unsatisfactory to speak in this manner: "Molt in *Himatione sanguinea* is the same as in *Vestiaria*" (p. 194) for there are differences. In such closely related birds one would not be surprised at finding the differences slight; however, a rather striking discrepancy, as seen in my specimens, is the failure of primaries to molt in postjuvenal molt in *Himatione*. Thus, I found primaries not involved in postjuvenal molt in any of 22 molting specimens of *Himatione* or in any of 11 additional specimens which had just completed postjuvenal molt. Amadon, however, cites two examples in which primaries appeared to him to be involved in postjuvenal molt; judging from my material these would be exceptional. Further, the postjuvenal molt in the secondaries in *Himatione* appears to be less extensive than in the secondaries of *Vestiaria*, as in 33 specimens of *Himatione* never more than 4 secondaries (Nos. 6–9) were replaced, and none at all were replaced in 26 of these, whereas in 18 specimens of *Vestiaria* up to 7 secondaries (Nos. 1–3, 6–9) were replaced, and in only 9 of these specimens were none at all replaced. Likewise, the replacement of greater

upper secondary wing-coverts was generally less extensive in *Himatione*. Thus, extent of wing feather replacement is a valid difference between the postjuvenal molt of *Himatione* and *Vestiaria*.

In his discussion of molt of adults appears the assertion: "In the subfamily Drepaniinae the primaries usually molt in August . . ." (p. 195). The majority of Amadon's data on this subfamily came from his work on *Vestiaria* and *Himatione*. To test this against my own series I have tabulated my data as follows:

NUMBER OF SPECIMENS WITH PRIMARIES MOLTING IN ADULT FALL MOLT

	June	*July*	*August*	*September*	*October*
Vestiaria	1	7	2	6	2
Himatione	1	3	3	3	2

Specimens which had completed the replacement of primaries but were still molting in other feather tracts were found in October (1 *Vestiaria*, 10 *Himatione*) and November (5 *Himatione*). It is evident that the primaries are in molt over a much longer period than Amadon visualized.

Amadon based his analysis of molt in adult drepaniids primarily on molt of the wing and tail quills ("Body molt is difficult to detect in the material examined, so the following remarks refer chiefly to molt of the wing and tail," he says on page 195). He goes on to cite data regarding wing and tail molt with only occasional remarks on body molt. Yet in rounding out his conclusions he seems to refer to molt in its entirety. Is it safe to make inclusive inferences from a restricted analysis of molt?

The reader is informed (p. 195): "In the subfamily Psittirostrinae, too, the annual molt usually occurs in late summer or early fall. Because of individual variation in the time of beginning of the molt, the molting period of each species is prolonged over roughly three months." Had Amadon analyzed body molt in adults, I think he would have realized that molt continues until October and November, whereas his "early fall" seems to imply September. He cites data on a series of *Loxops v. virens* to show that wing molt is usually completed before or in September, and then he adds, "October birds were in fresh plumage" (p. 195). My series of 40 adult *virens* which exemplify adult fall molt bear out the truth of his thought that wing quills have usually completed their molt by or in September, but they provide grounds for objection to the implication that October birds have completed their annual molt. In 14 adult *virens* I collected in October, only one had not yet completed molting of the remiges, while all 14 were undergoing extensive (for the most part) body molt. In 13 adult *virens* collected in November, five were still molting in various body tracts, whereas eight had terminated annual fall molt. This shows that body molt continues some weeks later than molt of the remiges.

On similar grounds the inception of annual molt in *virens* might be placed at midsummer (June) rather than "late summer" (my earliest specimen had started annual molt by May 11).

Referring back to the last part of the above quotation on Psittirostrinae, I disagree on the length of molting period which Amadon has suggested as three months. In *L. v. virens*, my conception of the duration of molt is that annual molt extends over roughly three months in *individual birds;* however, because of individual variation in the time of beginning of the molt, the molting period of the *population* is prolonged over six to seven months (May to November). My data on *Vestiaria* and *Himatione* are in agreement with a more lengthy period for adult molt than Amadon suspected. I feel that the long period of molt seen in these birds of a tropical locality has sig-

nificance in indicating a "lax" type of physiological adjustment to the environment, a relation which would be less forcefully evident if we accepted an unduly restricted view of the duration of molt.

Some questionable statements are made in the section on plumages, especially the one implying great variability and prolongation of postjuvenal molt and those implying that in general drepaniids undergo a complete postjuvenal molt. Elsewhere, along with seemingly valid ones, certain suspect generalizations are advanced con-

SEX RATIOS OF JUVENILE VERSUS ADULT DREPANIIDS

	Juveniles	*Adults*
Vestiaria	11♂ : 8♀	23♂ : 16♀
Himatione	15♂ : 21♀	52♂ : 31♀
Loxops v. virens	10♂ : 20♀	61♂ : 32♀

cerning molt in several species of drepaniids which I have not mentioned in these comments on molt. My suspicions are founded on small series of *Psittirostra bailleui*, *Hemignathus wilsoni*, and *Loxops maculata mana* which I collected on Hawaii. It would be worthwhile to assemble as much material as possible for these other less well known species of drepaniids to test Amadon's interesting ideas concerning the comparative timing of their molt.

Analyzing sex ratios of museum skins, Amadon found a peculiar preponderance of males in *Vestiaria* (73♂: 27♀) in the Bishop Museum series, though not in the series in the American Museum (16♂: 12♀). He felt that this "preponderance of males is sufficient to suggest that a real disparity exists in nature" (p. 207), though he also mentions the possibility that "the males are more active and vocal and hence are collected more often" (p. 207).

I have tabulated the sex ratios for three species of drepaniids obtained in my collecting on Hawaii. These include juveniles and adults: *Vestiaria coccinea* (34♂: 24♀), *Himatione sanguinea* (67♂: 52♀), and *Loxops v. virens* (71♂: 52♀). The total ratio of males to females in all these cases combined is 100 : 74. Thus the striking preponderance of males seen in one of the series of *Vestiaria* utilized by Amadon was not repeated in my material, and it seems highly doubtful that any such extreme disparity between the sexes exists in nature.

Proof of the effect of sex on conspicuousness in adult drepaniids can be obtained by comparing the incidence of the two sexes in skins of juveniles versus adults, which I have done for my series.

It seems reasonable that the larger numbers of adult males taken is accountable entirely on the basis of greater conspicuousness. In *Vestiaria* and *Himatione* the sexes look alike, but the males are slightly larger and probably more active and vocal; however, in *Loxops v. virens*, the males are definitely more vocal and also more brightly colored, hence the disparity in sex representation in my series was greatest of all for *virens*. As for the juveniles, the samples no doubt approach the random condition, where considerable variation toward either sex might be anticipated for samples of 36 specimens or smaller. The adult samples are not random in sex representation, and there is no valid reason to suppose that any such preponderance of males occurs in the wild among these species.

It is in the chapters on speciation and macro-evolution that Amadon brings to fruit his investigations. His outstanding contributions are the outlining of probable evolutionary mechanisms involved in producing differentiates within the two genera *Loxops* and *Hemignathus*. Great importance is attached to the rôles of geographic

isolation, to size and diversity of habitats, to sporadic dispersal of the birds to different islands, and to reverse dispersal to the original habitat with subsequent ecological divergence. His application of these and similar ideas is convincing.

The genus *Psittirostra* has not been so fully explained. Here is a situation where five species (the distinctness of which Amadon upholds) all occur on the one island, Hawaii. Only one of these species extends its range to other islands in the group. A sixth species occurs as two races on two leeward islands far removed from the main group of Hawaiian Islands. How could the sympatric existence of the five species on Hawaii have come about? Amadon briefly suggests that a series of dispersals to other islands, slight divergences occurring while there, and then reinvasions of Hawaii probably account for it. There are available few facts either to support or to gainsay this proposal. It might be further suggested that the several mountain peaks of the island of Hawaii itself were capable of providing isolated habitats between which gene flow could have been sharply reduced. It is interesting to note that this situation of multiple sympatry has not tempted Amadon to mention the possibility of initial habitat isolation, which Emerson (Allee, Emerson, Park, Park, Schmidt. Principles of Animal Ecology (Saunders Co., Phila.), p. 616) maintains is a theoretical possibility.

I can confirm Amadon's diagnosis of the parallelism in the sickle bill in the Drepaniinae and the Psittirostrinae, for I have found the bony support within the horny maxillary sheath differs markedly in its development in the two subfamilies. In *Vestiaria*, of the Drepaniinae, the internal bony support is stout and follows the bill outward nearly to the tip, whereas in *Hemignathus wilsoni*, of the Psittirostrinae, the bony support is quite slender and short and does not extend outward very far. The long, decurved bill of the Psittirostrinae may be a horny development primarily, whereas considerable growth of the supporting bone itself accompanies the enlarged sheath in the Drepaniinae. This would clearly constitute a proof of parallelism could the same relations be demonstrated in other long-billed members of the two subfamilies.

Amadon has included a chapter on phylogeny of the genera and of the family. Of course, the differentiation leading to the larger subdivisions of the family occurred long ago. His interpretations are illuminating and reasonable, but we can look forward to a more precise conception of the history of the Drepaniidae when geologists and botanists will have provided us with more information on the developmental history of the islands themselves and of their vegetation. Such data would permit us to know something of the succession of habitats available for colonization. Knowing the plant composition of these habitats would allow us to make inferences concerning the nature of selective forces which guided the adaptive radiation of the group.

Comprehensive though his approach has been, the scantiness of his data along some lines may not have warranted certain interpretations made, for many of these are based on slender evidence in the extreme. However, his important deductions on the mechanisms of evolution seem little or not at all affected by these shortcomings in much of his factual stock-pile. Now that such an assiduous study of speciation in this group has been carried out, it remains to amplify our knowledge of the Hawaiian honeycreepers along such lines as comparative functional anatomy, comparative behavior and its evolutionary development, comparative ecology and physiology, and historical origins of the group in correlation with the development of the environment.—PAUL H. BALDWIN.

Body insulation, heat regulation, and adaptation to cold in arctic and tropical mammals and birds.—P. F. SCHOLANDER, RAYMOND HOCK, VLADIMIR

WALTERS, LAURENCE IRVING, AND FRED JOHNSON. Biol. Bull., 99 (2): 225–271, 20 figs., 5 tables, October, 1950.—This general topic is discussed in three separate but consecutive papers and is an important contribution to an understanding of the physiological ecology of warm-blooded animals. Experimental studies were carried out on 18 species of Arctic mammals and five species of Arctic birds at Point Barrow, Alaska (latitude 71° N.), and on 16 species of tropical mammals and two species of tropical birds in the Canal Zone, Panama (latitude 9° N.). Mean monthly air-temperatures at the Arctic station varied in 1948 from − 29° C. in December to + 5° C. in July with the daily minimum going as low as − 43° C. On the other hand temperatures at the tropical station varied only slightly from + 28° C. Both oxygen consumption and carbon dioxide output were measured for Arctic animals but only carbon dioxide output for tropical ones. It is unfortunate that the techniques used at the two localities were not the same. There is an extensive analysis of literature dealing with temperate species.

No evidence was found for adaptive changes in body-temperature or in basal (standard) metabolism in the different climates. Body-temperature remains constant while the basal metabolic rate of terrestrial animals is fundamentally determined by an exponential relation to body size. The conclusion is arrived at that "phylogenetic adaptation to cold or hot climate has taken place only through factors that regulate the heat dissipation, notably the fur and skin insulation." In addition there are some behavior-adjustments that affect the rate of heat-loss from the body, such as nest-building, burrowing, and hibernation.

This basic assumption, that variations only in insulation are important in adapting animals to different climates, is not altogether convincing. The authors, themselves, note that in certain species the basal metabolism shows adaptative variation in different climates and that basal metabolism varies inversely with the efficiency of the body-insulation. They likewise acknowledge that acclimation in basal metabolism to different environmental temperatures can be obtained experimentally within the same individual and that seasonal changes in basal metabolism have been demonstrated in some species.

As air-temperature drops below 35° C., a zone of thermo-neutrality is described where body-temperature is maintained constant only through the physical regulation of heat-loss. This is effected through increasing the thickness of pelage or plumage by raising the hair or fluffing the feathers, by contracting the exposed body surface to decrease heat-radiation, by reducing the ventilation of the lungs, and by diminishing the amount of blood circulation through the legs, other appendages, or skin. Eventually, however, a critical air-temperature is reached where the maximum conservation of body-heat has been obtained and below which heat-production must be augmented if body-temperature is to remain constant. These critical air-temperatures for different species of tropical mammals are shown at 28° to 22° C., for tropical birds at 23° to 20° C. In Arctic species the critical temperature is reached at 18° C. for the least weasel, *Mustela rixosa*, which has the least effective insulation, at about 10° C. for the Snow Bunting, *Plectrophenax nivalis*, at − 5° C. for the Canada Jay, *Perisoreus canadensis*, and possibly at − 40° C. for the Glaucous Gull, *Larus hyperboreus*, and white fox, *Alopex lagopus*.

While there can be little doubt that a zone of relative thermoneutrality occurs for the large Arctic species, the authors appear to be forcing the data to fit their theories in indicating that for other species there are zones of temperature in which heat-production does not vary. There appear to be no *zones* of thermo-neutrality over any significant range of air-temperatures in the data presented for the least

weasel, for most of the tropical species, or for most of the species figured from data extracted from the literature. On the contrary, heat-production decreases progressively in these species until a high temperature is reached above which it again rises. A smooth curve can be fitted to the data that shows this change more accurately than do the straight lines that were drawn. It is very doubtful to the reviewer that physical and chemical heat-regulation are so sharply defined over different ranges of air-temperature and that the so-called "critical" temperature is really of as great significance as the authors make out. Admittedly, however, changes in physical regulation of heat-loss are relatively of greater importance at high air-temperatures and chemical regulation of heat-production of greater importance at low air-temperatures, but both types of regulation are probably functioning to some degree at all temperatures.

The rate of heat-loss from a hot plate at 37° C. through folds of skin and fur or plumage into air at 0° C. was measured quantitatively to test the effectiveness of body insulation. The insulating value of mammal-fur increased proportionately with its thickness in animals up to the size of the white fox. The fur of species larger than the fox was neither thicker nor of greater insulating value. The fur of some smaller Arctic mammals, such as the weasel, lemmings (*Dicrostonyx groenlandicus rubricatus* and *Lemmus trimucronatus*), ground squirrel (*Citellus parryi*), and shrew (*Sorex tundrensis*) was less effective insulation than that of some tropical species. These small mammals live in burrows during the winter, have well-insulated nests, or hibernate. They cannot sleep above ground in cold weather as do the larger species. The insulating value of the skin and plumage of birds was not accurately measured because of the difficulty of artificially fluffing out the feathers in a natural manner.

The legs of both mammals and birds are more poorly insulated than the body. The legs of most Arctic birds are naked (except for the Ptarmigan and Snowy Owl), yet acclimated Snow Buntings, Glaucous Gulls, and Ravens walked on snow at − 40° to − 50° C. without harm. A gull which had been kept indoors at + 20° C. for several months and hence not acclimated to outdoor temperatures quickly froze its feet when it accidentally escaped. Indirect evidence indicated that in birds acclimated to cold there is just enough blood-circulation through the legs to maintain their temperature slightly above 0° C. At high air-temperature, however, when excess body heat must be eliminated, the amount of circulation through the legs may be greatly increased and may be an important means for maintaining a constant body-temperature.

Below the critical air-temperature, heat-production is increased to compensate for the faster rate of heat-loss from the body. The maximum rate of heat-production of which most animals are capable, when stimulated by cold, is three to four times the minimum or basal rate. This is brought about by increased muscle-tone, shivering, or gross activity. The authors calculate that the increase in heat-production, as air-temperatures drop, is proportional to the increasing gradient between body- and air-temperatures and follows essentially, as one would expect, Newton's law of cooling. Tropical species have faster rates of increase in heat-production at low temperatures because their cooling rates are greater, due to lesser insulation. They much more quickly reach the limits of their ability to produce more heat and hence are considerably more sensitive and intolerant of drops in air-temperature. On the other hand, owing to efficient insulation, the white fox, Eskimo dog, Glaucous Gull, and probably the Canada Jay would need only a moderate increase in heat production to tolerate the coldest temperature on record (− 68° C.). Temperature-

regulation in the Snow Bunting is not as efficient and, under experimental conditions at − 50° C., its body-temperature dropped seriously. It is the only species of Arctic bird studied that regularly migrates out of the region for the winter-season.

These papers provide much new information on how homoiotherms have become acclimatized to varying climates in different parts of the world. The comparative study of basal metabolism, balances between heat-production and heat-loss, and effectiveness of body insulations is fundamental for characterizing the species phy iologically. The authors have provided a framework of theory that now needs to be tested by further experimentation and on a wider variety of species. There is need to determine how much of the difference noted is genetical and how much acquired by the individual during its life-time. Likewise it will be desirable to measure not only the heat-balance but also the total energy-balance of free-living animals over long periods of time under a variety of climatic conditions. This will require the measurement of voluntary food-consumption, the amount of energy in this food that is metabolized, and the total energy requirements under different simulated outdoor conditions. Only when we know, in each different climate, the amount of energy required for maintaining a normal existence and the amount of productive energy that an animal can or does acquire over and above that necessary for existence will we be in a position to interpret ecologically why animals are distributed the way that they are and why they behave as they do.—S. CHARLES KENDEIGH.

Speciation and Ecologic Distribution in American Jays of the Genus Aphelocoma.—FRANK A. PITELKA. Univ. of Calif. Publ. Zoöl., 50: 195–464, pls. 17–30, 21 figs. 1951.—During the past several years Pitelka has pursued an intensive field and museum study of the genus *Aphelocoma*. Almost 5000 specimens were compared and measured. The present volume is the principal result of this project, though there have been several preliminary or correlated published reports. *Aphelocoma* contains three species, two of which, the Scrub Jay, *coerulescens*, and the Arizona Jay, *ultramarina*, reach the southern United States. The third species, *unicolor*, apparently the most primitive of the three, is found in certain humid montane forests of Central America and southern Mexico. All three species occur in some parts of southern Mexico, though separated ecologically. After an introductory consideration of all the American jays and their distribution, each form of *Aphelocoma* is treated in great detail as regards plumage, measurements, geographical variation, distribution, and ecological requirements. No fewer than eight measurements were taken from each specimen and various methods of graphical and statistical presentation are employed to analyze individual, sexual, geographical, and other aspects of size variation. The color comparisons are of necessity somewhat more qualitative, but a colored plate by Sutton of six selected forms and photographs of specimens aid in evaluating shade and pattern. Variations in the bill, which seem to be correlated chiefly with differences in food, are also shown in photographs, as are characteristic habitats. There are many detailed distribution maps. Taxonomy and nomenclature are treated with equal thoroughness. New races described in this report are *A. coerulescens caurina* from Wedderburn, Oregon, and *A. coerulescens cana* from Eagle Mountain, Riverside County, California. Some 30 pages are devoted to a discussion of more general topics. Extent of variability and correlation between measurements agree, by and large, with what has been found in other passerine birds. The so-called ecological rules find but limited support. Type of habitat, whether dense scrub or more open growth, has had a greater effect on proportions, apparently, than has climate *per se*. Interspecific competition or absence of it has been of importance in some areas. In eastern Mexico, where *ultramarina* is absent, the resident races of

coerulescens resemble *ultramarina* in proportions and even, to some extent, in color and call notes. To the reviewer this is further evidence that parallelisms between races in related species often reflect similar responses to similar selective forces.

In a thought-provoking discussion of the ecological aspects of the species concept, Pitelka, while willing to retain the category of "superspecies" for strongly differentiated allopatric forms of common immediate ancestry, yet suggests tentatively that it may be best in some cases to regard allopatric forms as races when they seem unable to invade each other's ranges, even though there is reason to suspect that they may be intersterile. While this point of view is not without merit, it must be remembered that in some groups of animals there is evidence from fossils that related species even after they became *generically* distinct were unable to coexist but replaced one another in a time sequence. When two forms meet and, rather than merging by interbreeding, tend to compete or to replace one another there would seem no alternative but to call them species, regardless of how similar they are in ecology or (to our eyes) in appearance.

There is little room for serious criticism of this thorough and scholarly report. Indeed, the shortcomings of some other generic studies that have had ostensibly similar objectives become rather painfully evident by comparison. One must, however, question the wisdom of placing the detailed discussions of nomenclature, synonymy, etc. in a lengthy appendix, thus necessitating a rather large number of cross references. As a further consequence of this arrangement the general conclusions and summary are hidden somewhere in the middle of the volume, where the only one likely to see them (aside from reviewers who are morally obligated to read every page) is the tyro who consults the table of contents.—D. AMADON.

Ontario Birds.—L. L. SNYDER. Illustrated by T. M. Shortt. (Clarke, Irwin & Co. Ltd., Toronto, Canada), x + 248 pp., 146 line drawings, 1951. Price, $4.50.—Those who have been associated with Mr. Snyder over the years have long been aware of his desire to see the publication of an authoritative work on the birds of Ontario for the use and guidance of the working ornithologist. Lest there be any misunderstanding, it should be said at once that Ontario Birds was not written to fill that rôle. Such a volume still lies in the future, and it is to be hoped that Mr. Snyder can find the time to put it together.

However, Ontario Birds is in itself a notable achievement. Intended as "a source book for teachers, pupils, amateur naturalists, and all out-of-doors people," it is naturally a reflection of the author's extensive experience in both museum and field work. The book is a smooth and successful blend of the field-man's first-hand knowledge of bird habits and distribution, the systematist's interest in classification, and the curator's awareness of the questions about birds most often asked by the museum visitor. The text is gratifyingly readable and sustained in interest. Technical and semi-technical terms are followed by explanatory synonyms in parentheses —a practice which will doubtless be of assistance to the uninitiated, but tends to interrupt the otherwise free flow of prose.

Four preliminary chapters deal in fairly general terms with the characteristics, distribution, migration, and classification of birds. The last of these chapters ends with a list, by order and family, of the 351 species known to have occurred in Ontario on the basis of collected specimens. Those considered to be relatively unimportant elements are placed in brackets.

The main body of the book is then devoted to a natural history of Ontario birds. Several features distinguish this section from the treatment usually found in books devoted to the birds of a particular geographic region: 1) a good deal of emphasis is

placed on the family as a major unit of classification; external morphological characters of the family receive prominent attention in both text and drawings; 2) selective measures give greater weight to the commoner and more important species of Ontario birds; those of rare or accidental occurrence are given only cursory recognition; and 3) an uncommonly wide knowledge and perceptive insight is displayed in descriptions of bird behavior and such matters as niche preference.

Such phenomena as, for example, population cycles, predator-prey relations, color reversal, and eclipse plumage are introduced and neatly outlined where their discussion fits in logically under relevant species. However, attempts to interpret birds songs in phrases, words or syllables emphasize the difficulties involved in employing the English language for this purpose. As always, the impression remains that, in all but a very few instances, familiarity with a bird's song is a requisite before the written word or phrase can provide the reader with even an approximate rendition of the real thing.

Those familiar with Mr. Shortt's bird paintings will be gratified by the many line drawings which illustrate the text. The amazingly life-like postures and accuracy of detail that one has come to associate with Mr. Shortt's work are again evident here.

The book closes with a useful table of average spring arrival dates for 50 common migrants at 11 localities distributed through Ontario; the average time-lag between these localities is also indicated.

The inclusion of a bibliography of major references dealing with Ontario birds and ornithological texts of general value to Ontario students might have added to the book's usefulness as a teaching source.

All in all, it is an excellent book, and one that will fill a long-standing need in Ontario.—WILLIAM W. H. GUNN.

Check-list of Birds of the World. Volume 7.—JAMES LEE PETERS. (Mus. Comp. Zoöl., Cambridge), pp. x + 318, 1951. Price, $6.00.—With this volume Mr. Peters has begun the treatment of the Passeriformes, taking up the families Eurylaimidae, Dendrocolaptidae, Furnariidae, Formicariidae, Conopophagidae, and Rhinocryptidae. The first is strictly Old World in distribution and the remainder are New World.

In view of the extensive synonymies given by Hellmayr (Field Mus. Nat. Hist., Zool. Ser., 13, pts. 3 and 4, 1924 and 1925) for the American families, it has been thought unnecessary to repeat his references and there are thus given only the additions and changes developed since his volumes were published. In the families here concerned, these amount to some 300 names. For the Eurylaimidae, Sharpe's Hand-List (vol. 3, 1901) is continued as the basic work. In this family, the additional names, recognized or synonymized, amount to more than two and one-half times the number cited by Sharpe. Original references are, of course, given in every case.

The major groups, from order to family, follow Wetmore's classification as in previous volumes of the series. The arrangement of genera and species is the author's own, according to his studied beliefs as to natural affinities. Subspecies follow a geographical pattern. Bibliographic references are given under each genus to critical discussions where may be found reviews of the species concerned. Footnotes are added where new concepts are involved or where there are unsolved questions. The plan of the volume thus agrees with that of the preceding parts.

Work has been active in recent years in the field covered by volume 7, and the book shows the result of a careful examination of existing evidence, presenting a fresh view of the classification of the groups concerned. It maintains the high standard

set by the antecedent volumes and forms an important part of this *vade mecum* of the ornithological taxonomist.—JOHN T. ZIMMER.

The Birds of Newfoundland.—HAROLD S. PETERS AND THOMAS D. BURLEIGH. (Department of Natural Resources, Province of Newfoundland, St. John's), pp. xix + 431, 32 col. pls., 40 line drawings, and map end-papers by Roger Tory Peterson, 1951.—By far the greater part of this handsome book, the first really definitive work on the birds of the world's tenth largest island and "Canada's newest province," is devoted to writeups concerning the 47 resident, 74 summer resident, 17 winter resident, 14 transient, 13 visitant, 23 casual visitant, 37 accidental visitant, and two extinct birds believed by the authors to live (or have lived) there. The first 43 pages give us certain statistics about the island, briefly chronicle the ornithological work done there, and dip into such subjects as the development of plumage, the activities of birds (song, courtship, nest-building, etc.), aids to identification, geographical distribution and life zones, and conservation and protection of birds. The chapter on systematic classification ends with an interesting and useful list of 24 birds described from Newfoundland, with the type localities.

Some statements in this introductory part of the book should have been much more carefully worded. The sentence "Among most water birds the flight feathers are all molted at once, so the bird is flightless for a time after the nesting season" (p. 14) is misleading. Most (probably all) ducks, geese, swans, grebes, loons, and alcids certainly do become flightless during the post-nuptial molt; but what of the host of gulls, terns, pelicans, cormorants, albatrosses, petrels, herons, and shorebirds that do not? The sentence "The molt proceeds gradually from the nestling plumage to that of the juvenile then into the winter plumage" (p. 13) is anything but clear. Among passeriform birds that I have worked with, the nestling plumage (*i. e.*, either that immediately following the natal down or, in case the bird is hatched naked, the very first plumage it wears) *is* the juvenal plumage, and the molting of some or all this plumage results in the first winter plumage. It is true that some young passerines appear to wear a plumage intermediate to the juvenal plumage and the first winter plumage, but the more I study this particular plumage-stage the more convinced I am that the puzzling, new, non-plumulaceous feathers of the "juvenal" plumage are actually part of the first winter plumage.

As for the annotated list of species (pp. 46 to 399), persons desiring information about Newfoundland birds *as such* will be apt to feel that too much space has been given the accidental visitants (many of which have been recorded only once), and not nearly enough to such birds as—the Greater Yellow-legs, which breeds widely and in some numbers in the interior; the Greater Shearwater, a "common summer visitant offshore from May to October"; the Pigeon Hawk, whose breeding populations may well be more dense than any on the North American mainland; and the Yellow-bellied Flycatcher, which is—at least locally—very abundant in summer. Some readers will feel, too, that more space should have been given to birds of basic economic importance. By this I mean neither the Ptarmigan, which may lure hunters from afar, thus bringing the province a certain amount of business, nor the Ruffed Grouse and Spruce Grouse, which Peters and Burleigh recommend be introduced, but rather the Common Eider, which might, conceivably, become an important source of revenue if managed for its down, and the baccalieu birds (murres), tinkers (Razor-billed Auks), Kittiwakes, and Puffins which have been, and are, so widely used as food. Speaking for myself, I think more space should have been given certain species about whose nesting comparatively little has been written—*e. g.*, the Pine Grosbeak, Rusty Blackbird, and Fox Sparrow. No one can blame the authors

for wishing their work to be entirely inclusive—to give a complete picture of Newfoundland birdlife; the point is, do they emphasize the essential Newfoundland element sufficiently? Do they not, in giving so much space to the accidentals and casuals, and so little, comparatively, to birds best known among Newfoundlanders, throw the whole picture slightly out of focus?

The statement on the jacket to the effect that the book "covers half the species to be seen in northeastern North America" may be the key to the trouble. Surely what was needed was not another book dealing in general with any part of northeastern North America—but a book so centered on Newfoundland that every page would emphasize Newfoundland bird habits and habitats, Newfoundland nest-sites and nest materials, Newfoundland migrations, etc. There is not a photograph of Newfoundland in the book—a profound pity, not alone because good photographs would have shown bird habitats but because they would have added character and beauty.

Newfoundland's birdlife is, in certain ways, downright puzzling. One cannot help wondering why the Green-winged Teal should be a "common summer resident" while the American Widgeon is only accidental; or why the Ring-necked Duck should breed occasionally while the Lesser Scaup does not. The extreme rarity of the Killdeer is the more remarkable because the Spotted Sandpiper is so widely distributed and common. I, for one, would have been glad to read the authors' comments on some of these phenomena. I wish the book had included special discussions of the forests, the flat boggy parts of the high interior, the mountains, the beaches, the rocky coasts, and the fog-hung Grand Banks as ecological units. I wish there had been a relief map.

Some of the above has the sharp ring of adverse criticism, to be sure. Wholly in the book's favor we must say that it includes a very great deal which will be of value to Newfoundlanders. Many a user will have no other bird book in his library; for such as these the pages abound in useful and interesting reading. The descriptions and life history material have been written with care. The volume is highly presentable, with its decorative format and open, readable type. The color-plates represent Peterson at his best. Composites though they are—and as such the bane of the bird artist's existence—they are, nevertheless, well composed and ecologically sound. The gray background tones very accurately represent Newfoundland weather and scenery—a fact which will probably escape the notice of those who have never visited the island. Some of the backgrounds show actual landscapes and seascapes, thus taking the place of habitat photographs to some extent. The plate of the accipiters and falcons strikes me as being especially good. The hypothetical list and extensive bibliography will be of special value to those interested in pursuing further the subject of Newfoundland ornithology. The provincial government, for its determination to see a book on Newfoundland birds a *fait accompli*, and the authors for their able collaboration in the enterprise, are to be congratulated.—GEORGE MIKSCH SUTTON.

Wildlife Management.—IRA N. GABRIELSON. (Macmillan Co., New York), xii + 274 pp., 40 illus., 8 tables. Price, $4.50.—Dr. Gabrielson, who was director of the U. S. Fish and Wildlife Service for 11 years, includes not only birds and mammals in his definition of "wildlife" but fish as well. This no doubt will give the layman a clearer meaning of the term since "wildlife" is too generally understood to mean only land animals. Management is defined basically as "meeting the biological needs of wildlife" plus the modifying "of human activities that affect wildlife and human use of the wildlife resources."

The book is directed to those interested in wildlife and is well-written. The author presents an honest appraisal of both the weaknesses and strong points of wildlife management. The lack of technical terms is refreshing. Each chapter is a complete discussion of a topic—covering its history, its rôle in wildlife management, and its value. A list of basic references follows each chapter. The photographs are excellent but probably would be more effective if shown with the topic under discussion.

The author emphasizes repeatedly the need for better methods in biological research in game and fish management. Great improvements in methods of public education and state administration are also prime necessities. A much greater public participation in wildlife programs is called for.

The book consists of 13 chapters plus an index. The first three chapters discuss problems, research, and education in wildlife management, in that order. The next seven cover more specific methods of management. Chapters 11 and 12 discuss sportsmanship and administration in wildlife management. The final chapter attempts to answer the question "Can public hunting and fishing be maintained?" The author's "Yes—but . . ." answer gives a thought-provoking picture of what this comparatively new profession of wildlife management must strive for. This is a good book for the public, the student, and the professional management man.—LEONARD DURHAM.

Life Sciences at the University of Utah.—RALPH V. CHAMBERLIN. (Univ. Utah, Salt Lake City), xv + 417 pp., numerous figs., 1950. Price $3.50.—An historical account detailing the educational and research activities in the biological field at the University of Utah. These have been in large part concerned with the study of the fauna and flora of the Great Basin region. The first chapters are devoted to the early natural history lore, such as ethnobiology, the explorers and early naturalists, nature and the pioneers, the development of museums, natural history teachings, and the early history of the University. This is followed by the subsequent history of courses and activities, the establishment of the Medical School as an offshoot of the biology work, the rôles of many individuals, and finally the later growth and fruition, including graduate degrees and theses and the fields and growth of research. A list of publications is included year by year. Perusal of this material will reveal that the University has been somewhat of a center of ornithological research throughout the years albeit largely on problems of local concern.

Although pointed in a different direction, this publication quite coincidentally serves as something of a companion volume to Ewan's 'Rocky Mountain Naturalists' which is devoted essentially to the east side of the region.—WILLIAM H. BEHLE.

ALLISON, F. R., M. A. BARRAS-SMITH, A. DARLINGTON, AND M. L. R. ROMER. 1951. Migrants observed from ocean weather ships, July–October, 1950. Brit. Birds, **44** (7): 219–222.

AMADON, DEAN. 1951. Le pseudo-souimanga de Madagascar. Oiseau, **21** (1): 59–63, 2 figs.—A study of the endemic genus *Neodrepanis* of Madagascar shows it to be a member of the Philepittidae rather than of the Nectariniidae. The chief differences between *Neodrepanis* and *Philepitta* are in the structure of the beak and tongue.—C. Vaurie.

ARMINGTON, SVEN. 1951. Polygami och polyterritorialism hos törnsångaren (*Sylvia communis* Lath.) (A case of bigamy and holding two territories by a Whitethroat). Vår Fågelvärld, **10** (1): 26–31, 2 figs. in text.—English summary. A five-year-old color-ringed male in 1945 established two breeding territories,

about 300 yards apart and 750 yards from the ringing place. After the first hen had completed her clutch he copulated with a second but took part in the incubation and feeding of the young only in the first territory. The second hen succeeded in raising her brood without assistance from the bigamous male.—T. Malmberg.

ARNOLD, JOHN W., RUTH M. HORNER, VERNA ROSS, AND MARY STUART. 1951. Breeding-bird census, 1950. Can. Field-Nat., 65 (2): 81.—In Carleton Co., near Ottawa, Ontario.

BAERG, W. J. 1951. Birds of Arkansas. Revised Ed. (Univ. Arkansas College Agric., Fayetteville) Bull. 258 Rev., pp. 1–188, 49 figs., 1 table.—The avowed intent of this publication is to furnish information to teachers of biology and nature study. The list of forms includes 354 species and subspecies; accounts of these give data on migration, song, nests, and food habits, as well as a description and the range occupied. A table shows the periods of song of certain species for five years.—H. I. Fisher.

BAL, C. 1951. Prooien van Sperwers, *Accipiter nisus* L. in het roestbos. Ardea, 39: 218–222.—Feeding habits of the European Sparrow Hawk.

BARBOUR, ROGER W. 1951. Observations on the breeding habits of the Red-eyed Towhee [*Pipilo erythrophthalmus erythrophthalmus*]. Amer. Midl. Nat., 45 (3): 672–678, 3 figs.

BARRUEL, P. 1951. Vitesse de vol du Martin-pêcheur. Oiseau, 21 (1): 69–70.—*Alcedo atthis* observed flying at a speed of about 65 kilometers per hour.

BARRUEL, P. 1951. Occupations successives d'un trou de Pic épeiche. Oiseau, 21 (1): 70–71.—Successive nesting of *Dryobates major* and *Passer montanus* in the same hole.

BEDFORD, DUKE OF. 1951. Homing Budgerigars. Avic. Mag., 57: 47–50.—Normally, Budgerigars are wandering birds, and the domesticated stock has retained this habit of the wild ancestors, usually soon straying if given liberty. The Dule of Bedford has succeeded in establishing by selection a strain of these tiny parrots that have lost the lust for travel and that stay around the spot where they have been liberated.—J. Delacour.

BEDFORD, DUKE OF. 1951. The breeding of the Blue Ringneck. Avic. Mag., 57: 143–144.—Blue phases of plumage occur at rare intervals in the wild state among dominantly green parrots, and strains of some of them have become well established in captivity, particularly of *Melopsittacus undulatus* and *Agapornis personata*. A few blue specimens of Ringnecks, *Psittacula krameri*, have been recorded from India, but none had bred in captivity before. From a pair received in 1949 from Calcutta, the Duke of Bedford obtained in 1951, three young of exactly the same blue color as the parents.—J. Delacour.

BEIDLEMAN, RICHARD G. 1951. Recent bird records from northeastern Colorado. Condor, 53 (5): 260–261.—Annotated list of 14 species rare in Colorado and previously unreported from the northeastern portion of the state.

BERLIOZ, J., AND P. ROUGEOT. 1951. Etude d'une collection d'oiseaux du Gabon. Bull. Mus. Nat. Hist. Nat., 2 (23): 66–76.—List of birds collected at Oyem, Northern Gaboon, by P. Rougeot, with notes on several rare species.

BERLIOZ, J. 1951. Réflexions sur la systématique ornithologique et la nomenclature. Oiseau, 21 (2): 135–144.

BLAKE, CHARLES H. 1951. On the problem of the return of migratory birds. Bird-Banding, 22 (3): 114–117.

BLAKE, CHARLES H. 1951. An example of sexual bias in trapping. Bird-Banding, **22** (3): 117–119.—Many more male Red-eyed Towhees, *Pipilo erythrophthalmus*, trapped than females.

BLAKE, CHARLES H. 1951. A method of estimating association of individuals. Bird-Banding, **22** (3): 119–121.

BOND, JAMES. 1951. First supplement to the check-list of birds of the West Indies (1950). (Acad. Nat. Sci. Phila., Pa., August, 1951), pp. 1–22.

BOND, JAMES. 1951. Notes on Peruvian Fringillidae. Proc. Acad. Nat. Sci. Phila., **103**: 65–84.—Species accounts containing locality records and critical taxonomic comment based on external features.

BOROVSKY, PAUL. 1951. L'époque des migrations et ses rapports avec l'histoire de certaines espèces. Oiseau, **21** (2): 146–148.

BOUDOINT, YVES. 1951. Le vol du Circaète Jean le blanc, plus particulièrement dans le Massif central. Alauda, **19** (1): 1–18.—Detailed observations on the flight of *Circaetus g. gallicus*, illustrated by 14 excellent sketches by P. Barruel. Various types of flight are studied in detail. An interesting and valuable contribution.—C. Vaurie.

BROEKHUYSEN, G. J. 1951. Some observations on the nesting activities of the Redwing Starling, *Onychognathus morio morio*. Ostrich, **22**: 6–16.

BROOKS, MAURICE. 1951. English Sparrows [*Passer domesticus*] eating locust leafminers. Wilson Bull., **63** (2): 116.

BROWN, R. B. 1951. Rearing Regent Bower Bird in captivity. Avic. Mag., **57**: 94–95.—Young Regent Birds were taken from the nest and hand reared in Australia. Valuable observations were made at the nest.—J. Delacour.

BRYENS, OSCAR MCKINLEY. 1951. Some notes on activities of the Northern and Migrant shrikes. Bird-Banding, **22** (3): 121–125.—*Lanius b. borealis* and *Lanius ludovicianus migrans* at a banding station.

CARPENTER, CHARLES C. 1951. Young Goldfinches [*Spinus tristis*] eaten by garter snake. Wilson Bull., **63** (2): 117–118.

COLQUHOUN, M. K. 1951. The Wood Pigeon [*Columba palumbus*] in Britain. Agric. Res. Council (London), Rept. Series No. 10: vi + 69, 7 figs., 45 tables.—This is an abridged account of a comprehensive study made of this species by the British Trust for Ornithology. The study originally emphasized the control of the Wood Pigeon and its relations to agriculture and forestry, and this aspect is noted throughout. However, the present report includes data on many features of the pigeon—nests, breeding, habitat selection, populations, behavior, development and molts, age determination, weights, food habits—and special sections on relations to man and population problems. It is noted that control is not necessary at present, probably as a result of decreased predator control and increased hunting pressure during the war.—H. I. Fisher.

CURRY-LINDAHL, KAI. 1951. Skruvflykt hos kråkfåglar (Gyration in corvines). Vår Fågelvärld, **10** (2): 75–78.—English summary. On May 19, 1949, near Windsor in England, examples of *Corvus c. corone* and *Corvus frugilegus* were observed some hours after noon ascending in gyration, sometimes disappearing above the clouds. All passing corvines, but never other birds, were drawn into the movement, where wings were moved only occasionally. Birds from a rookery in the vicinity seemed to use the air currents in order to rise and then headed towards the feeding places in a gliding manner, returning in their usual flight.—T. Malmberg.

DAVIES, J. J. L. 1951. Some observations of the South African Harrier Hawk,

Polyboroides typus typus [*Gymnogenys typicus*]. Ostrich, **22**: 39–40.—Nesting in hole in cliff.

DAVIS, DAVID E. 1951. The analysis of population by banding. **Bird-Banding, 22** (3): 103–107.

DE CHAVIGNY, J. 1951. Transport d'un jeune par une Poule d'eau *Gallinula chloropus* (L). Alauda, **19** (1): 51–54.—An adult was observed in flight while carrying a young, apparently holding it in its toes. Other species that are known to displace their young are mentioned.—C. Vaurie.

DELACOUR, J. 1951. Taxonomic notes on the Bean Geese, *Anser fabalis* Lath. Ardea, **39**: 135–142.—Distributional study of the complicated variations of the species, according to recent researches, particularly first-hand information from H. Johansen. Six subspecies recognized; one described as new—*Anser fabalis johanseni* from Tai-pai Shan, Tsinling Mountains, N. W. China.—C. Vaurie.

DELACOUR, JEAN. 1951. Commentaires, modifications et additions à la liste des oiseaux de l'Indochine Française. Oiseau, **21** (1): 1–32; and (2): 81–119.—The nomenclature, status, and distribution of the rich avifauna is brought up to date. The list of genera is reduced, new records are noted, and two new subspecies are described: *Pellorneum ruficeps deignani*, Daban, southern Annam, and *P. r. dilloni*, Trangbom, Cochinchina, Among the most important systematic notes are: 1) a discussion of *Francolinus boineti*, which is well-depicted in a color plate and which is tentatively considered to be a color variant of *F. pintadeanus;* 2) a revision of the Indochinese races of *Pellorneum ruficeps;* and 3) a discussion of *Pycnonotus sinensis*.—C. Vaurie.

DE MAERSCHALCK, J. 1951. Notes relatives à la nidification du blongios *Ixobrychus minutus* (L.). Gerfaut, **41** (1): 1–14.—Habitat, nesting, sounds, behavior, development of young, migration. Dutch summary.

DENTON, J. FRED, AND ELON E. BYRD. 1951. The helminth parasites of birds, III: Dicrocoelid trematodes from North American birds. Proc. U. S. Natl. Mus., **101**: 157–202, figs. 34–40, 1 table.—Survey of occurrence in more than 700 specimens of 134 species belonging to 40 families.

DERAMOND, M. 1951. Quelques observations sur le petit pluvier a collier en Sologne. Oiseau, **21** (1): 55–58.—Notes on the nesting and behavior of *Charadrius dubius curonicus* in France.

DESAI, P. K. 1951. Breeding Grey Parrots for thirty years. Avic. Mag., **57**: 98–102.—Record of the nesting in captivity in India of the popular African Parrot, which is a shy breeder in confinement.

DEXTER, RALPH W. 1951. Unusual nesting behavior of a Chimney Swift [*Chaetura pelagica*]. Amer. Midl. Nat., **46** (1): 227–229.

DEXTER, RALPH W. 1951. Diary of five Chimney Swifts [*Chaetura pelagica*]. Ohio Journ. Sci., **51** (1): 42–46.—Records of successive matings and nest-sites of banded swifts.

DORST, JEAN. 1951. Contribution à l'étude du plumage des Coucous métalliques du genre *Chrysococcyx* Boie. Bull. Mus. Nat. Hist. Nat., (2) **23**: 173–180.—Microscopical study of the metallic feathers of these small African Cuckoos. The feathers of the brilliant *C. cupreus* are very different in structure from those of the less bright *C. caprius*.

DORST, JEAN. 1951. Recherche sur la structure des plumes des Trochilidés. Mém. Mus. Nat. Hist. Nat., N. S., A. Zoologie, **1**: 125–260.—There have long been in Paris ornithologists particularly interested in hummingbirds. Today, Prof. J. Berlioz not only has under his care the historic specimens of the Museum, but he

also owns personally the finest private collection, the nucleus of which is constituted by the late Eugène Simon's famous series. It is therefore fitting that Dr. Dorst, his pupil and assistant, has undertaken a thorough study of the structure of the feathers of the Trochilidae, a subject which had so far been somewhat neglected despite the evident interest of their great peculiarity. It has necessitated an immense amount of microscopical work, conducted with great technical ingenuity. Contour feathers of hummingbirds are relatively few in number, and scale-like in appearance. Many show metallic hues which are caused by the very special structure of the "barbules." All aspects of the problem are investigated in detail and interpreted wisely in this most important contribution.—J. Delacour.

DORST, JEAN. 1950. La coloration du plumage chez les Oiseaux. Scientia, **44**: 311–315.—A short general account of coloration in bird plumages, and of the structure and pigments of feathers.

DURANGO, S. 1951. Om törnskatans (*Lanius collurio* L.) spetsning av bytesdjur (The impaling habits of the Red-backed Shrike). Vår. Fågelvärld, **10** (2): 49–65, 5 figs. in text.—English summary. In literature the following interpretations of the cause of the impaling habit of the bird are proposed: a) the feet being too weak to hold the prey when cut into pieces; b) the impaled prey forming some kind of store; and c) manifestation of cruelty and rapacity or without real purpose. At once c) is rejected and even a) since the feet of the bird are unusually strong and it sometimes eats vertebrates without impaling them. The habit is never seen in winter quarters but only in the breeding area, where many individuals have to be fed by one or two providers, and for climatic reasons living prey can be difficult to find. The stores are often emptied during early morning hours or periods of rain and coldness, when insect activity is low. The habit seems to occur in all English shrikes, most often in central Sweden, but seldom on the island of Fårö north of Gotland, where the number of hours of sunshine compared with England is very high. Evidently the impaling habit has a meaning in procuring a store, though at times and in places of abundant food it seems supererogatory.—T. Malmberg.

EAST, BEN. 1951. Enjoy them while they last. Nat. Hist., **60** (7): 327–334, 11 ills.—Popular account of certain species which are "vanishing," primarily shorebirds.

EGGELING, W. J. 1951. Ringed birds recovered in Uganda. Uganda Journ., **15** (1): 17–25.—Data on 109 birds banded, chiefly in Europe, and recovered in Uganda up to Oct. 1, 1950, with particular details on the White Stork, Black Stork, Scandinavian Lesser Black-backed Gull, European Swallow, and Black Kite.—H. Friedmann.

ELLENBERGER, P. M. 1951. Notes on some birds of the Ndanga (Zaka) district of Southern Rhodesia. Ostrich, **22**: 17–24.

ENEHJELM, C. AF. 1951. Breeding of the Green-rumped Parrotlet (*Forpus passerinus passerinus*). Avic. Mag., **57**: 53–56.—Observations on the nesting in captivity of this pigmy South American parrot.

ERGENE, SAADET. 1945. Türkiye Kuslari. (Kenan Matbaasi, Istanbul), Istanbul Univ. Fen Fakültesi Monograf., **4**: 1–362, 35 pls., 1 col. map, 104 pls., 333 figs.—In modern Turkish. The birds of Turkey are treated in species accounts, with general range, measurements, description, occurrence in Turkey, biotope, and local occurrence of subspecies.

FONTAINE, VIKING. 1951. Mindre liran, Puffinus puffinus (Brünnich), en för Sverige ny fågelart (The Manx Shearwater new to Sweden). Vår Fågelvärld, **10** (1): 16–26, 4 figs. in text.—English summary. First two records apart from sub-

fossil bones and remnants in Stone Age settlements, together with description and survey of distribution, migration, and breeding biology.—T. Malmberg.

GABRIELSON, IRA N., AND FREDERICK C. LINCOLN. 1951. The races of song sparrows in Alaska. Condor, **53** (5): 250–255.—Systematic review of eight races including two new subspecies, *Melospiza melodia maxima*, a permanently resident form of the western Aleutians ranging from Atka to Attu, and *M. m. amaka* from Amak Island located north of the western end of the Alaska Peninsula.—W. H. Behle.

GEORGE, JOHN L. 1951. Marsh Hawk [*Circus cyaneus*] catching a Mourning Dove [*Zenaidura macroura*]. Wilson Bull., **63** (2): 112.

GIBSON, J. A. 1951. The breeding distribution, population, and history of the birds of Ailsa Craig. Scot. Nat., **63** (2): 73–100, 7 figs., 3 tables (to be cont.).

GLENNY, FRED H. 1951. A systematic study of the main arteries in the region of the heart—Aves 22. Passeriformes—Corvidae, Part 1. Amer. Midl. Nat., **45** (3): 679–682, 3 figs.

GODFREY, W. EARL. 1951. Geographical variation in the Boreal Chickadee east of the Rockies. Can. Field-Nat., **65** (1): 22–26.—Characters, measurements, and distribution given for four races, with relevant comment. *Parus hudsonicus farleyi*, resident in parts of Alberta, Mackenzie, Saskatchewan and Manitoba, is newly described.—W. W. H. Gunn.

GOODWIN, DEREK. 1951. My Magpies, past and present. Avic. Mag., **57**: 10–15. —Study of the habits and behavior of tame European Magpies.

GRABER, RICHARD AND JEAN. 1951. Nesting of the Parula Warbler in Michigan. Wilson Bull., **63** (2): 75–83, 1 fig.—Four active nests of *Parula americana* were found in Emmett Co., Michigan, and observations were made of the nesting habits and success.

GUICHARD, G. 1951. Les flamants de Camargue. Oiseau, **21** (1): 48–54, 3 figs.—Notes on the nesting and behavior of this famous colony of Flamingos, which despite some setbacks seems to be flourishing.

HACHISUKA, MASAUJI, AND TATSUO UDAGWA. 1951. Contribution to the ornithology of Formosa. Part II. Quart. Journ. Taiwan Mus., **4** (1–2): 1–180.—The present part contains the systematic accounts by species. Most of the information is concerned with description of male and female plumages, with an occasional note on juvenal plumage, and with distribution. However, many of the accounts contain data on habitat, nest and eggs, migration, and behavior.

HACHLER, EMIL M. 1951. A new local race of the Hazel-Grouse (*Tetrastes bonasia* [L]) from the East-Carpathian Mountains. Aquila, **51–54**: 82–84, 1944–1947.—*Tetrastes bonasia horicei* from Jasina (the Polonins).

HAMERSTROM, F. N., JR., AND FRANCES HAMERSTROM. 1951. Mobility of the Sharp-tailed Grouse [*Pedioecetes phasianellus*] in relation to its ecology and distribution. Amer. Midl. Nat., **46** (1): 174–226, 12 figs., 5 tables.—The Hamerstroms have spent several years studying this and related species in Wisconsin and Michigan. Banding and intensive field study show that autumn coveys (8–30 birds) have definite ranges and a cruising radius of up to a mile. Packs form later in the fall, and the birds live in the edges of brush and open woods during the winter. The packs break up in spring and the birds move into open areas.

Birds seldom move farther than three miles (one moved 21 miles). Dancing grounds for males that were retrapped were less than one and one-half miles from wintering quarters. Transplanted birds may move greater distances than those in the home area.

This grouse is practically gone from the prairies, and the present range is in or adjoining brushlands, ravines, or small openings in the forest. Loss of range and decrease in numbers of grouse are proceeding hand in hand.—Harvey I. Fisher.

HANZÁK, JAN. 1951. Zpfava o hnízdění volavek červených, Ardea purpurea L., a volavek bílých, Egretta alba (L.). Sylvia, **11–12** (4): 85–97, 1949/50.—Breeding records of Purple Heron and Great White Heron in Bohemia; English summary of these records and some natural history notes.

HAUSMAN, LEON A. 1951. Beginner's guide to attracting birds. (G. P. Putnam's Sons, New York), pp. 1–127, many figs. Price $2.00.—Houses, feeding stations, foods, birdbaths, dust baths, and plantings for specific forms.

HAVERSCHMIDT, FR. 1951. The nest and eggs of *Smaragdites t. theresiae*. Wilson Bull., **63** (2): 114–115, 1 fig.—A hummingbird of Venezuela and Brazil.

HEIM DE BALSAC, H. AND T. 1951. Les migrations des oiseaux dans l'ouest du continent africain. Alauda, **19** (1): 19–39.—A continuation of an article on migration in Africa, with dates and critical notes on migration.

HERVOUET, L. 1951. Notes sur l'élevage et l'hybridation du bouvreuil. Oiseau, **21** (1): 64–68.—Successful crossing in captivity of a male canary with a female bullfinch.

HOWARD, HILDEGARDE. 1951. Pleistocene duck bones from Ohio. Condor, **53** (4): 205.—Measurements of several bones of an anatine duck from Pleistocene lake beds at Lockland, Hamilton County, Ohio.

HOYT, J. SOUTHGATE AND SALLY F. 1951. Age records of Pileated Woodpeckers. Bird-Banding, **22** (3): 125.—A banded *Dryocopus pileatus* was shot at an age of 10 years. A nestling raised by the authors died of kidney trouble at the age of nine and a half years.

HUBBS, CARL L., AND GEORGE A. BARTHOLOMEW, JR. 1951. Persistence of a rare color aberration in the Heermann Gull. Condor, **53** (5): 221–227.—Summary of 20 records of birds with white patch near the bend of each wing, which character has been reappearing for nearly a century with great rareness, perhaps one in 10,000. Discussion of possible origin and evolutionary significance.—W. H. Behle.

HUNT, O. D. 1951. Displacement display of female Great Tit evoking mating response by male Chiffchaff. Brit. Birds, **44** (8): 278.—A female *Parus major*, disturbed by the author's presence, perched 20 feet from her nest with her beak full of food, shivered her wings, and called continuously with a querulous note. Her mate ignored her, but a male *Phylloscopus collybita* mounted her three times; her behavior was not altered.—M. M. Nice.

HURLBURT, W. E. 1950. An unusual collection of Canadian birds. Avic. Mag., **57**: 18–21.—Account of the collection of live native birds of Mr. H. Roy Ivor, in southern Ontario. Longevity data are included

JOUANIN, CHRISTIAN. 1950. Catalogue systématique des types de Trochilidés du Museum National d'Histoire Naturelle de Paris. Bull. Mus. Nat. Hist. Nat., **22** (2), suppl. 2: 1–27.—Annotated list of the types of hummingbirds in the Paris Museum, where a rich and historic collection is deposited.

JOUANIN, CHRISTIAN. 1951. Des Cormorans à Paris. Oiseau, **21** (1): 71–73.—Unusual record of a small flock of *Phalacrocorax carbo* in the heart of Paris.

JUNGE, G. C. A. 1951. Resultaten van het ringonderzoek betreffende de vogeltrek, ingesteld door het Rijksmuseum van Natuurlijke Histoire to Leiden, XXXVI (1949). Limosa, **24** (1–2): 27–53.—List of birds banded and recovered in the vicinity of Leiden.

KAGELMANN, GERHART. 1951. Studien über Farbfelderung, Zeichnung und Färbung der Wild- und Hausenten. Zool. Jahrb., **62**: 513–630, 9 tables, 38 figs.—An investigation of the degree to which the diversity of form in domestic ducks is different from that in their wild relatives. With abundant figures he compares the color-fields, patterns, and pigmentation of the plumage based on studies of 1457 specimens of wild ducks and a smaller number of domestic varieties. The Mallard, *Anas platyrhynchos*, is considered the stem form of all culture varieties and shows that the domestic duck has the same pattern and variations. White-spotting in this form may produce extensive white areas, and melanism, superimposed on this albinism, may produce other patterns. He concludes that all of the pattern models can be derived from a single form—the female type of plumage. The diversity of domestic forms he considers explicable on a pluripotential concept of genetics but is unable to explain the fact that color fields, models, and pigments appear in domestic forms that are rare or lacking in the wild condition. He theorizes that domestication has its effect through disharmonious effects on the growth and pigmentation of the individual feather. His assumption that the female plumage is the basic type from which others are derived is suspect on the evidence of pattern alone, but it also does not fit well with studies of hormones in which it is shown that male plumage may be genetically basic. Whereas the male plumage may be unaffected by injection of female hormone, female plumage can be changed to male by injection of male hormone in certain species.—W. J. Beecher.

KNOUFF, R. A., AND F. A. HARTMAN. 1951. A microscopic study of the adrenal of the Brown Pelican. Anat. Rec., **109**: 161–178, 4 pls.

KELSO, LEON. 1951. Demonstrating the glandularity of the feather. Biol. Leaflet No. 57: 1–4.—Interesting and thought-provoking speculations about the functions of feathers.

KIST, J. 1951. Zwartkopmeeuw, *Larus melanocephalus* Temm., op "De Beer." Larus, **24** (1–2): 3–6, 1 pl.—Third record of Mediterranean Black-headed Gull in the Netherlands.

KLOMP, H. 1951. Over de achteruitgang van de Kievit, *Vanellus vanellus* (L.), in Nederland en gegevens over het legmechanisme en het eiproductie-vermogen. Ardea, **39**: 143–182. Summary in English.—Causes for present decrease in numbers of the Lapwing in Holland are studied. Gathering of eggs is not an important cause, as birds lay again several times if the nest is robbed, but are single-brooded when successful. Improvement of grasslands and other fields seems more significant. The species has tremendous power of recovery.—J. Delacour.

KLUIJVER, H. N. 1951. The population ecology of the Great Tit, *Parus major major* L. Ardea, **39**: 1–135.—A detailed, exhaustive study of the population density, ecology, and breeding habits of the Great Tit, based on observations and experimentations started in 1912 in Holland. The economic importance of the species determined its being chosen for a thorough and lengthy survey. Population fluctuations are recorded and analyzed. This is a very important contribution to the life habits of this successful species, whose high rate of mortality is compensated for by large and numerous broods.—J. Delacour.

KUBIK, V. 1951. Přispěvek k hnízdní biologii dudka (Upupa epops). Sylvia, **11–12** (4): 97–102, 1949/50.—Notes on the nest, eggs, development, and behavior of the Hoopoe.

LABITTE, ANDRE. 1951. Notes sur la biologie de reproduction d'*Oriolus oriolus* en pays drouais. Alauda, **19** (1): 40–48.—Notes on behavior, nesting, and incuba-

tion. The nest is built by the female alone, which may work on it for as much as 14 consecutive hours. The clutch consists normally of four eggs. The laying season does not exceed 37 days (May 20–June 26).—C. Vaurie.

LABITTE, ANDRE. 1951. Notes biologiques sur la Chouette chevêche, *Carine noctua vidalii*. Oiseau, **21** (2): 120–126, 2 figs.—Observations on ecology, behavior, and nesting. The same nesting site is used year after year by the same pair. First laying dates are given for a period of 32 years, the average date being April 18. After hatching, the young occupy the nest for a minimum of 30 days.—C. Vaurie.

LACK, DAVID AND ELIZABETH. 1951. Decouverte de la reproduction d'*Apus pallidus* en France. Alauda, **19** (1): 49.—First nesting record for France.

LAWS, JUAN THEUNE. 1951. Observaciones sobre la Lloica (*Pezites militaris militaris*). Invest. Zool. Chilenas, **1** (4): 6–7.—In Spanish; summaries in English and German. Records on food intake of a captive nestling.

LAWSON, DOUGLAS F. 1951. Notes on breeding behaviour of Nightjar. Brit. Birds, **44** (8): 281–282.—Incubation period at a nest of *Caprimulgus europaeus* was 17 days; fledging 21 days.

LEOPOLD, FREDERIC. 1951. A study of nesting wood ducks in Iowa. Condor, **53** (5): 209–220.—Utilization of nesting boxes, egg laying, incubation, hatching, departure from the nest, and travel of the brood to water.

LINSDALE, JEAN M. 1951. Fifth ten year index to the Condor. Pacific Coast Avif. No. **30**: 1–117.—Covers volumes 41–50, 1939–1948.

LINSDALE, JEAN M. 1951. A list of the birds of Nevada. Condor, **53** (5): 228–249.—Up-to-date entries to follow the author's summary of 1936 (Pacific Coast Avif. No. 23). The list now contains 309 full species and 87 additional races.—W. H. Behle.

LUMSDEN, H. G. 1951. Breeding diving ducks on Lake St. Clair, Ontario. Can. Field-Nat., **65** (1): 31–32.—In 1949, small populations of Redheads and Ruddy Ducks nested in a marsh at the estuary of the St. Clair River.

MACDONALD, J. D. 1951. Types and type localities of Alexander's Damaraland birds. Ostrich, **22**: 2–5.

MACLEOD, J. G. R. 1951. The Maccoa Duck, *Oxyura jamaicensis maccoa*. Ostrich, **22**: 37.—Habits.

MAYAUD, NOËL. 1951. Martinet pâle et Martinet noir. Alauda, **19** (1): 49–51.—Comments on the observations of Lack, D. and E. in Alauda, 19 (1): 49, 1951.

MAYAUD, NOËL. 1951. Comportement bizarre chez un Coq domestique. Alauda, **19** (1): 56.—Queer behavior of a rooster and a goat fighting each other.

MCCABE, ROBERT A. 1951. The song and song-flight of the Alder Flycatcher. Wilson Bull., **63** (2): 89–98, 1 fig., 1 table.—A discussion of the geographical variation of the song of *Empidonax t. traillii* and a description of a flight song and other features of its song.

MEES, G. F. 1951. Het areaal van *Zosterops palpebrosa buxtoni* Nicholson op Java. Ardea, **39**: 196–218. Summary in English.—The grey-bellied *Z. p. buxtoni* is found on high ground in a few localities in western Java, while the yellow-bellied *Z. p. gallio* occupies the rest of the island. The author considers *buxtoni* as also occupying Sumatra (*Z. p. sumatrana* Kloss is a synonym).

MILLER, ALDEN H., AND LOYE MILLER. 1951. Geographic variation of the screech owls of the deserts of western North America. Condor, **53** (4): 161–177.—Analysis of variable characters and distribution of eight races in the lower Colorado River drainage basin, adjoining parts of the Great Basin and the watersheds of the

trough of the Gulf of California. Clines are featured. *Otus asio yumanensis* is described from lower Colorado River Valley.—W. H. Behle.

MOORE, HILARY B. 1951. The seasonal distribution of oceanic birds in the western North Atlantic. Bull. Marine Sci. Gulf and Caribbean (Univ. Miami Press), **1** (1): 1–14.—Log of observations from the Woods Hole Oceanographic Institution vessel *Atlantis*.

MOREAU, R. E. 1951. The British status of the quail and some problems of its biology. Brit. Birds, **44** (8): 257–276.—*Coturnix coturnix* is now comparatively rare due to excessive capture in spring and fall; the little that is known of its life history is summarized and a two-and-a-half-page bibliography appended.

NAETHER, CARL A. 1950. The Book of the Racing Pigeon. (McKay Co. Inc., New York), x + 244 pp., 24 pls. Price, $3.50.—Pigeon fanciers will welcome the information presented here in easy-to-read fashion. The literature has been searched for pertinent data, to which the author has added salient facts from his 40 years' experience with pigeons.

Starting with a history of the subject, Mr. Naether proceeds to write of the pigeon in war, peace, racing, training, and breeding. The last two chapters are devoted to magazines and books dealing with the racing pigeon.—H. I. Fisher.

NERO, ROBERT W. 1951. Pattern and rate of cranial 'ossification' in the House Sparrow. Wilson Bull., **63** (2): 84–88, 3 figs.—In *Passer domesticus* the ossification of the skull is progressive and symmetrical, becoming complete at an age of approximately 200 days.

NORRIS, ROBERT A. 1951. Distribution and population of summer birds in southwestern Georgia. Occ. Publ. Georgia Orn. Soc. (Athens), No. **3**: 1–67, 15 figs. Price $1.25.—Annotated list with brief discussions of affinities and "invasions." Pages 38 to 50 are devoted to summer populations in three plant communities—old field and fence row; mature longleaf pine forest; and beech-magnolia hammock.

ÖSTERLÖF, STEN. 1951. Fiskgjusens, Pandion haliaëtus (L.), flyttning (The migration of Swedish ospreys). Vår Fågelvärld, **10** (1): 1–15, 6 figs. in text, 3 tables. English summary.—Of 1805 ringed birds 236 were recovered, 130 of these during first autumnal migration taking place in August–September on a broad front from Sweden towards the south-southwest. Lack of autumn recoveries of old birds in Spain and Italy is deemed dependent on these birds' less pronounced aversion to crossing the Mediterranean, but the material is probably too little for such a conclusion. Only five recoveries during the second year after hatching, all from Africa, suggest that the birds do not leave the winter quarters prior to that age. At two years the ospreys are roaming northwards but with very few exceptions they do not reach the breeding area. The bird evidently matures at three years and from that age on there are numerous recoveries within 100 km. of the ringing-place.—T. Malmberg.

PENNIE, IAN D. 1951. The history and distribution of the Capercaillie in Scotland. Part 3. Scot. Nat., **63** (1): 4–17.

PENNIE, I. D. 1951. The Clo Mor bird cliffs. 1951. Scot. Nat., **63** (1): 26–32, 2 figs.—Species accounts.

PHELPS, WILLIAM H., AND WILLIAM H. PHELPS, JR. 1951. Las aves de Bonaire. Bol. Soc. Venezolana Ciencias Nat., **13** (77): 161–187, 5 photos, map, 1950.—Short historical discussion and accounts of 71 specimens of 19 species taken November 26–30, 1947, on island of Bonaire.

PHILLIPS, ALLAN R. 1951. Complexities of migration: a review, with original data from Arizona. Wilson Bull., **63** (2): 129–136.

PITELKA, FRANK A. 1951. Breeding seasons of hummingbirds near Santa Barbara, California. Condor, **53** (4): 198–201.—Data based on a total of 331 dates for nests and eggs presented for *Calypte anna*, *Selasphorus sasin*, *Archilochus alexandri*, and *Calypte costae*, together with a brief exploratory discussion of ecological overlap between the species.

PLATH, KARL. 1951. Breeding of Goldie's Lorikeet (*Psitteuteles goldiei*). Avic. Mag., **57**: 133–135.—Record of the first breeding in captivity of a small species of nectar-eating parrot from New Guinea.

PLOWES, D. C. H. 1951. A new race of Cape Bunting from Mashonaland. Ostrich, **22**: 35.—*Fringillaria capensis smithersii* from Martin Forest Reserve, Chimanimani Mts., on border Southern Rhodesia and Portuguese East Africa.

PORSILD, A. E. 1951. Bird notes from Banks and Victoria islands. Can. Field-Nat., **65** (1): 40–42.—Observations made in July–August, 1949.

PRESTWICH, ARTHUR A. 1951. Records of parrots bred in captivity. Part II (Cockatoos and Macaws). (A. A. Prestwich, London), pp. 33–69.

PRESTWICH, ARTHUR A. 1951. Records of parrots bred in captivity. Part III (Conures, Parrotlets, and Parrots). (A. A. Prestwich, London), pp. 70–121.

PULICH, WARREN M., AND ALLAN R. PHILLIPS. 1951. Autumn bird notes from the Charleston Mountains, Nevada. Condor, **53** (4): 205–206.—Additional records and comparisons with earlier observations of van Rossem (Pacific Coast Avif. No. 24, 1936).

RAND, A. L. 1951. Birds of Negros Island. Fieldiana. Zool., **31** (48): 571–596.—Based on Dr. D. S. Rabor's recent collecting, 13 new records are listed for Negros, and the variation in a number of Philippine species is discussed. It is shown that there are differences between many island populations, and there are gradual progressive changes from island to island. These clines are not always parallel and similar end products may exist in distant islands.

RAND, A. L. 1951. Review of the subspecies of the Sunbird *Nectarinia jugularis*. Fieldiana. Zool., **31** (49): 597–607.—Philippine Islands forms only are treated; four races are recognized. The central form from southern Luzon to Mindanao is very variable. Color characters are assigned numbers and these are plotted on a map to show that the population of each island is different, but overlap in characters prevents recognition by name of any of them.

RAO, N. S. KRISHNA. 1951. *Paracuaria macdonaldi* n. g., n. sp. (Family Acuariidae, Subfamily Acuariinae) from the Sea Gull (*Larus argentatus*). Can. Journ. Zool., **29** (3): 167–172.—A nematode found in the gizzard of 14 Herring Gulls from the Ottawa River, near Ste. Anne de Bellevue, Que.—W. W. H. Gunn.

RAO, N. S. KRISHNA. 1951. *Cosmocephalus firlottei* n. sp. (Family Acuariidae) from the Sea Gull (Larus argentatus). Can. Journ. Zool., **29** (3): 173–177.—A nematode found in the esophagus of each of 14 Herring Gulls from the Ottawa River.

RAO, N. S. KRISHNA. 1951. *Echinochasmus cohensi* n. sp. (Family Echinostomidae, Subfamily Echinochasminae) from the Sea Gull, *Larus argentatus*. Can. Journ. Zool., **29** (3): 215–218.—A trematode found in the intestine; Ottawa River.

RASHEVSKY, N. 1948. Mathematical Biophysics (Rev. Ed.). (Univ. of Chicago Press, Chicago), 669 pp.—Chapter 52 is a mathematical analysis of the "flight of birds and insects in relation to their form."

RINEY, THANE. 1951. Relationships between birds and deer. Condor, **53** (4): 178–185.—Observations on birds and mule deer made in the central Sierra Nevada involving bird-deer contacts and food relationships.

ROUGEOT, P. C. 1951. Nouvelles observations sur le *Melichneutes robustus*. Oiseau, **21** (1): 127–143, 1 fig.—Interesting observations on the flight behavior of this rare honey-guide in northern Gaboon.

SALOMONSEN, FINN. 1951. Grønlands/Fugle/The Birds of Greenland. Part II. Paintings by Gitz-Johansen. (Einar Munksgaard, Copenhagen), pp. 159–348, 19 col. pls. Price, $9.00.—The present volume includes ptarmigan, plovers, sandpipers, phalaropes, gulls, etc. See 'The Auk' (68 (1): 119–120, 1951) for review of Volume 1.

SAUNDERS, ARETAS A. 1951. The song of the Song Sparrow. Wilson Bull., **63** (2): 99–109, 3 figs., 1 table.—An analysis of the similarities and differences in 884 records of songs of *Melospiza melodia*.

SAVILE, D. B. O. 1951. Christmas bird census—1950. Can. Field-Nat., **65** (2): 68–76.—Censuses from 27 locations across Canada. Some of these also appear in 'Audubon Field Notes,' but many do not. A useful additional source for those working over Christmas census data.—W. W. H. Gunn.

SERGEANT, DAVID E., AND RICHARD F. WHIDBORNE. 1951. Birds on Mingulay in the summer of 1949. Scot. Nat., **63** (1): 18–25, 3 figs.—Species accounts.

SKALLER, F., AND G. W. GRIGG. 1950. The effect of orally administered synthetic oestrogen (hexoestrol) on the male fowl. Australian Journ. Agric. Res., **1** (4): 496–516, 3 figs., 9 tables, 2 pls.—Controlled experiments with 141 male chickens showed that oestrogen was a stimulator of the anterior pituitary gland during the first phases of its administration and a depressor of this gland after a certain level had been reached. Effects of administration varied with age, with breed, and with tissue involved. For example, the testis responded to a greater extent than did the comb or epidermis of the rooster. Fat from the birds treated with 25 mg. of hexoestrol daily for three weeks did not produce oestrogenic effects when injected into mice.—H. I. Fisher.

STEINBACHER, GEORG. 1951. Die Zungenborsten der Loris. Zool. Anz., **146**: 57–65, 7 figs.—An interesting study in functional and microscopic anatomy. The feeding, brush-tongued lories plunge the almost-closed bill into flower-heads, then open the mandibles and protrude the bristle-armed tongues. The lever-mechanics of tongue architecture and musculature, especially by which the bristle field of the tip is opened and closed, are illustrated schematically.

STEINBACHER, JOACHIM. 1951. Vogelzug und Vogelzugforschung. (Waldemar Kramer & Co., Frankfurt am Main), 184 pp.—This is a brief summary of some of the factors involved in migration—weather, season, flight direction, instinct, wintering grounds, race, speed of flight, migratory unrest, magnetism, age, sex, body weight, etc. Short accounts of banding and of some of the more important banding stations are included. For certain species, for example the larks, gulls, ducks, cranes, and the Golden Plover, the data are detailed.—H. I. Fisher.

STIRLING, W. T. 1951. Great Skua [*Stercorarius skua*] using its feet in an attack upon a Gannet. Scot. Nat., **63** (2): 133–135.

STOTT, KEN. 1951. A nesting record of Hornbills in captivity. Avic. Mag., **57**: 113–118.—Observation of the first instance of the nesting of the Great Hornbill, *Buceros bicornis*, in the San Diego Zoo, with many interesting details. Both male and female worked at plastering the hole. The female died in the hole before the two eggs hatched. Few records of Hornbills nesting in captivity exist so far.

STORER, ROBERT W. 1951. The seasonal occurrence of shorebirds on Bay Farm Island, Alameda County, California. Condor, **53** (4): 186–193.—Results of periodic censuses for a year beginning July 1, 1949, in this area of concentration of

birds. Twenty-three species were observed, the data being presented in species accounts for each.

STORER, ROBERT W. 1951. Variation in the Painted Bunting (*Passerina ciris*), with special reference to wintering populations. Occ. Papers Mus. Zool. Univ. Mich., No. **532**: 1–12.

STRESEMANN, ERWIN. 1951. On the supposed identity of Emberiza hyperborea Pallas with Pipilo fuscus Swainson. Condor, **53** (5): 257.—Proposes that the name *Emberiza hyperborea* Pallas be relegated to the rank of obligatory synonym.—W. H. Behle.

STRESEMANN, ERWIN. 1951. Histoire des origines des "Planches Coloriées" de Temminck et Laugier. Oiseau, **21** (1): 33–47.—These letters of Temminck and Laugier to Lichtenstein between the years 1819 and 1821 are of great interest and give the genesis of a great ornithological classic with revealing insights into the psychology of the ornithologists of that time. Temminck is self-revealed as pompous and pretentious and Lichtenstein as being a very lazy correspondent. Vieillot is dismissed contemptuously as a "petit savant à appointement," a term which might be translated as a "cheap little scientist for hire." History has reversed this verdict. It is to be hoped that Dr. Stresemann will publish more of these interesting correspondences.—C. Vaurie.

SUTTON, GEORGE MIKSCH. 1951. Caprimulgus ridgwayi in Michoacan, Mexico. Condor, **53** (5): 261–262.—Four specimens collected; discussion of color variation.

SUTTON, GEORGE M. 1951. The Rufescent Tinamou. Wilson Bull., **63** (2): 67–68, 1 pl.—Notes on the habitat and nesting and other habits of *Crypturellus cinnamomeus*.

TABER, WENDELL. 1951. The northern element in the summer bird life of south-central New England. Wilson Bull., **63** (2): 69–74.

TAYLOR, LOIS CHAMBERS. 1951. Prior description of two Mexican birds by Andrew Jackson Grayson. Condor, **53** (4): 194–197.—The Socorro Towhee, *Pipilo carmani* Lawrence, 1871, becomes a synonym of *Pipilo socorroensis* Grayson, 1867. The Socorro Wren, *Troglodytes insularis* Lawrence, 1871, becomes a synonym of *Thryothorus sissonii* Grayson, 1868.

TAYLOR, WALTER P., AND ALLAN J. DUVALL. 1951. The Lucifer Hummingbird in the United States. Condor, **53** (4): 202–203.—Summary of the eight specimens (one newly reported), six of which are from the Chisos Mountains, Texas. No certain breeding records for the United States.

TENER, JOHN S. 1951. Sixth census of non-passerine birds in the bird sanctuaries of the north shore of the Gulf of St. Lawrence. Can. Field-Nat., **65** (2): 65–68.

TORDOFF, HARRISON B. 1951. A quail from the Oligocene of Colorado, Condor, **53** (4): 203–204.—Discussion of the characters of the distal end of a left tarsometatarsus from Logan County, Colorado, which most closely resembles the corresponding element of *Colinus* and *Lophortyx*. The specimen is left unnamed.

TRAYLOR, M. A. 1951. A review of the Woodpeckers *Chrysoptilus melanochloros* and *C. melanolaimus*. Fieldiana. Zool., **31** (41): 421–437.—Five races of each species are recognized. Though often considered as forming one species, the pattern of variation and distribution in the subspecies indicates two groups, best treated as species.

TURČEK, FRANTIŠEK J. 1951. Galls and gall-insects as food of certain birds and mammals. Suomen Hyonteistieteellinen Aikakauskirja, **17** (1): 17–22, 10 photos.

VERHEYEN, R. 1951. Phaenologisch onderzoek over de terugkeer van trekvogels

in Belgie. Gerfaut, **41** (4): 14–43.—Studies, by species, of migrating birds returning to Belgium. There is also some general discussion. French summary.

VERHEYEN, R. 1951. Particularités relatives à la migration et au quartier d'hiver du coucou d'Europe (*Cuculus canorus* L.). Gerfaut, **41** (1): 44–61, 3 figs.—Dutch summary.

VON BOETTICHER, HANS. 1951. Etwas über Zehenreduktion bei Vögeln. Zool. Anz., **146**: 113–118.—The author believes that "trans-specific macroevolution," as seen in the involution of the hind toe in plovers and other birds, requires no special evolutionary explanation other than mutation. In the ostrich, loss of the hind toe and reduction of an anterior one by pleiotropic mutation has resulted in enlargement of an inner toe and the sole of the foot. Toe reduction, taken alone, has no taxonomic value because it occurs generally as a spontaneous mutation in unrelated species.

VOOUS, K. H. 1951. Distributional and evolutionary study of the Kingfisher genus *Ceyx* in Malaysia. Ardea, **39**: 182–196.—Plausible explanation of the puzzling distribution of *Ceyx erithacus* and *Ceyx rufidorsus*, and their relationship with related forms, confirming previous opinions of authors, particularly S. D. Ripley.—J. Delacour.

WALTERS, J. 1951. De Avifauna in "Plan Tuinstad Slotermeer" (Amsterdam-West) in de periode October 1948 tot October 1949. Limosa, **24** (1–2): 12–26, 4 figs.—Changes in the avifauna with man-made changes in the habitat west of Amsterdam.

WEBB, C. S. 1951. The Wattled Starling (*Creatophora carunculata*). Avic. Mag., **57**: 79–82.—Observation of the seasonal changes in the head caruncles and feathering of this interesting starling, observed at liberty and in captivity; excellent colored plate by D. M. Henry.—J. Delacour.

WETMORE, ALEXANDER, AND WILLIAM H. PHELPS, JR. 1951. Observations on the geographic races of the Tinamou *Crypturellus noctivagus* in Venezuela and Colombia. Bol. Soc. Venezolana Ciencias Nat., **13** (77): 115–119, map, 1950.—Critical review of forms based on "nearly 50 skins."

WETMORE, ALEXANDER. 1951. The identity of two Asiatic birds recorded from Nunivak Island, Alaska. Condor, **53** (4): 206–207.—The Grasshopper-Warbler, *Locustella ochotensis*, is referable to the race *L. o. ochotensis* (Middendorff) and the Accentor, *Prunella montanella*, although slightly intermediate toward *montanella* is referred to *P. m. badia* Portenko.—W. H. Behle.

WHITE, C. M. N. 1951. Systematic notes on African birds. Ostrich, **22**: 25–26.—Generic limits.

WIGMAN, A. B. 1951. Waarneming van de noordse waterspreeuw, *Cinclus c. cinclus* (L.), in Gelderland. Limosa, **24** (1–2): 1–2, 1 pl.—One of five or six records of the Black-bellied Dipper in the Netherlands.

WILLIAMS, J. G. 1951. The birds of Bwamba: Some additions. Uganda Journ., **15** (1), 107–111.—Four birds new to Uganda—*Cuculus gabonicus*, *Chaetura ussheri sharpei*, *Melanopteryx maxwelli*, and *Spermospiza poliogenys*. Other notes are supplemental to the van Somerens' 1949 report on the Bwamba avifauna.—H. Friedmann.

WILLIAMSON, KENNETH. 1951. The moorland birds of Unst, Shetland. Scot. Nat., **63** (1): 37–44.—General account.

WILSON, N. H. 1951. Hybrid Glaucous x Great Black-backed Gull at Limerick. Brit. Birds, **44** (8): 286–287.—Description of an immature *Larus marinus* by *L. hyperboreus* watched in August, 1948.

WOLFE, L. R. 1951. Eggs of the Falconiformes. Part II. Ool. Rec., **25** (3): 36–42.

YEALLAND, J. 1951. Notes on some birds of Hawaii. Avic. Mag., **57**: 39–46.—The author went to Hawaii in 1949 to assist in the project of propagation of the nearly extinct Hawaiian Goose or Nene. He also observed a number of native and naturalized birds.

ZIMMER, JOHN T., AND WILLIAM H. PHELPS. 1951. New subspecies of birds from Surinam and Venezuela. Amer. Mus. Novit., No. **1511**: 1–10.—*Aratinga pertinax surinama* from Surinam; *Aratinga pertinax venezuelae* from Altagracia, Río Orinoco, Bolívar, Venezuela; and *Amazilia fimbriata obscuricauda* from Guasdualito, State of Apure, Venezuela.

ZIMMER, JOHN T. 1951. Studies of Peruvian birds. No. 60. The genera *Heliodoxa, Phlogophilus, Urosticte, Polyplancta, Adelomyia, Coeligena, Ensifera, Oreotrochilus,* and *Topaza*. Amer. Mus. Novit., No. **1513**: 1–45.—The following monotypic genera are considered inseparable from *Heliodoxa: Phaiolaima, Ionolaima, Agapeta, Lampraster,* and *Eugenes*. Hence the Rivoli's Hummingbird of the A.O.U. list will be known as *Heliodoxa fulgens* by those who follow Zimmer in this decision. New subspecies: *Coeligena iris flagrans* from Chigur, Dept. of Cajamarca, Perú.—D. Amadon.

OBITUARIES

ANNIE MONTAGUE ALEXANDER, a Life Associate of the A.O.U. from 1911, died in Oakland, California, on September 10, 1950, at the age of 83. Born in Honolulu, Oahu, Hawaii, December 29, 1867, she was the daughter of Samuel T. Alexander and Martha E. Cooke, both children of early American missionaries in Hawaii and the Marquesas.

Miss Alexander was educated at Punahou School in Honolulu, the Oakland High School, California, Lasell Seminary, Massachusetts, and abroad, in Berlin and Paris, where her major interests were art and music. Serious eye trouble, however, forced her to relinquish these studies and never permitted her to resume them. Returning to Oakland, she audited classes at the nearby University of California at Berkeley. Among these happened to be the paleontological classes of John C. Merriam. It was he who inspired her with a life-long interest in the vertebrates and impressed upon her the university's need for comparative osteological material of Recent birds and mammals.

For 50 years Miss Alexander made generous contributions toward the field expenses of groups exploring fossil localities in the western United States. Many times she accompanied field parties and always proved to be a patient and diligent worker. With her life-long friend and companion, Miss Louise Kellogg, she made trips to Alaska, British Columbia, Hawaii, Samoa, Egypt, Baja California, and many of our western States, collecting, taking notes, and personally preparing approximately 3,300 specimens for the university.

In 1907 her hope of securing and housing Recent material for the University was realized in the establishment by her of the Museum of Vertebrate Zoology at the University at Berkeley. This and the Museum of Paleontology were amply endowed by Miss Alexander. In addition, in 1948 she deeded to the University Regents property which, when sold, resulted in a fund of nearly $33,000, divided at her request, for the support of student research in the two museums. Through her frequent

conferences with the directors of these two institutions Miss Alexander kept in close and sympathetic touch with the needs of graduate students and often thoughtfully supplied small sums, large in the aggregate, to be spent for their individual needs in the way of books, field trips, or small collections of pertinent materials.

Many fossils, seven Recent mammals, a bird, a fish, three reptiles, and a genus of grasses perpetuate the name of Annie M. Alexander, as does the gratitude of the changing host of graduate students, who through half a century received her aid before they went forth to occupy responsible positions in state or federal work, or to teach in institutions of higher learning.—HILDA WOOD GRINNELL.

Ross STEWART BAKER, an Associate of the American Ornithologists' Union, elected in 1946, died at Toronto, Canada, on March 27, 1951. Ross was born at Rochelle, Illinois. When he was 16 he moved with his parents to Toronto. By 1928 he had become Chief Engineer for General Airways in northwestern Quebec. Ill health forced him to retire in 1938.

He married Maureen Kelly in October, 1937. In 1942 they settled in Toronto, and he soon became one of Toronto's most active bird banders. Mrs. Baker shared his interest in bird banding. He banded over 8000 individuals of 82 species in his small city yard after receiving his license to band on March 9, 1943. He also participated in expeditions to band Ring-billed Gulls nesting on small islands in Georgian Bay.

Ross made careful notes on the behavior of birds around and in his traps and when being handled, as well as any individual anomalies such as frozen feet or crossed mandibles. His special study was the Starling. He banded over 4000 of these in eight years and made careful color sketches of their beaks to show the seasonal and sexual variations.

At meetings of the Toronto Ornithological Club he was a frequent contributor to the program, giving detailed observations of his Starling work, summarizing his banding records for a year or behavior studies of some individual. Several automatic traps of his own manufacture reflected his engineering experience and ingenuity.

Ross Baker will be remembered by his Toronto ornithological friends for showing what can be accomplished by working a small area for all it is worth, with patience, with imaginative technique, with an enquiring and relating mind, with organized, meticulously kept records.—J. MURRAY SPEIRS.

SHERMAN CHAUNCEY BISHOP, an Associate of the American Ornithologists' Union, elected in 1919, died in Rochester, New York, May 28, 1951, in his 64th year. He was born in Sloatsburg, New York, November 18, 1887, and was educated at Cornell University where he received the degree of B.S. in 1913 and Ph.D. in 1925. He was a member of the Cornell Okefinokee Expedition of 1912, and served as assistant entomologist at Cornell from 1909 to 1913, as plant pathologist and entomologist from 1914 to 1915, and as biologist from 1915 to 1916. From 1916 to 1928 he was zoologist of the New York State Museum at Albany. During the next five years, 1928 to 1933, he was assistant professor of biology at the University of Rochester, and professor of zoology from 1933 until his death.

Primarily a general zoologist, Professor Bishop was especially interested in reptiles and batrachians and was elected a vice-president of the Society of Ichthyologists and Herpetologists in 1932. Apparently he published little or nothing on birds.—T. S. PALMER.

EWART LOUNT BRERETON, an associate of the A.O.U. since 1935, died at Barrie, Ontario, Canada, on July 5, 1950. He was born at Schomberg, Ontario, on January 9, 1876, the son of a physician, the late Dr. W. J. Brereton, and Anna Lount. He attended schools in Schomberg and Aurora and later went to the University of Toronto, graduating from the Royal College of Dental Surgeons in 1897. After practicing dentistry briefly in Schomberg and Grand Valley he went to Barrie in 1900 where he carried on a successful dental practice for 50 years.

His interest in natural history resulted from early visits to Algonquin Park and his association with Major Mark Robinson, then Superintendent. His last visit to the park was made just a few weeks previous to his death. An ardent naturalist, his chief interest was in ornithology. In this field he soon became recognized as a keen and capable observer. He contributed much information on birds to the Royal Ontario Museum of Zoology. He also supplied valuable records for 'Birds of Algonquin Provincial Park' (MacLulich, 1938) and for 'Birds of Simcoe County, Ontario' (Devitt, 1944). He was elected a director of the Federation of Ontario Naturalists in 1948.

In the vicinity of Barrie his reputation as an authority on bird-life was well-known and many were the calls he received to identify some unusual bird. He gave many lectures to local groups, led bird hikes, conducted Christmas censuses, and wrote nature articles for the Barrie 'Examiner.' He also contributed short articles to the 'Canadian Field-Naturalist' and the Toronto Field-Naturalists' Club's 'Newsletter.'

In the field his enthusiasm was boundless and until a few years ago he could outwalk many younger men. An excellent correspondent, he found great delight in discovering and recording a new bird for his locality. His cheerful personality and kindliness will remain a cherished memory to all who knew him.—O. E. DEVITT.

MARCEL HENRI FELIX DE CONTRERAS, a Corresponding Fellow of the A.O.U., elected in 1923, who died in Brussels on December 28, 1949, had been one of the founders of the Société Ornithologique du centre de la Belgique, the organ of which was called 'Le Gerfaut.' The Société was dissolved during the 1914–1918 war, but 'Le Gerfaut' was revived, mainly by the late Chevalier van Havre, and it is still being published. M. H. de Contreras wrote a number of articles on the birds of Belgium, which were later on published in a popular volume "Les Oiseaux observés en Belgique," 1905–1907. Personal difficulties prevented him from making further contributions to ornithology during the last 30 years.—J. DELACOUR.

WALTER ELMER EKBLAW, an Associate of the American Ornithologists' Union, elected in 1910, died in Grafton, Massachusetts, June 5, 1949. He was born at Rantoul, Illinois, March 10, 1882. In 1910 he was graduated from the University of Illinois where he specialized in geology, botany, and ornithology. An M.A. was received from this institution in 1912. He was chosen botanist and geologist of the MacMillan-Crocker Land Expedition in 1913 and spent four years in northwestern Greenland. From 1917–1923 he was research associate with the American Museum of Natural History.

The degree of Ph.D. was received from Clark University in 1926, the two previous years having been spent as honorary fellow at this school. In 1928 he became a full professor in the department of geology, a position retained until his death. He was made a Knight of the Order of the North Star (Sweden) in 1942 and was given the honorary degree of doctor of science by Upsala College in 1947.

Dr. Ekblaw was managing editor of 'Economic Geology,' founder and first president of the Forbush Bird Club of Worcester, Massachusetts, and served for 19 years as director and secretary of the Worcester Natural History Society. He was also a

director of the Massachusetts Audubon Society. Few teachers were more intensely interested in the training of youth in natural history and conservation. Aside from his numerous publications in scientific journals, he conducted a column, "Wake Robin," in the Worcester Sunday Telegram, wherein he discussed birds and kindred subjects in natural history.—A. W. SCHORGER.

ALDEN HERVEY HADLEY, an Associate of the American Ornithologists' Union since 1906, died in Anderson, Indiana, on February 26, 1951. Born August 6, 1876, on a farm in Morgan County, Indiana, south of Monrovia, he acquired in his youth an avid interest in birds. His formal education was received at Guilford College, Earlham College, Stetson University, and the University of Chicago. Due to his great ability as a lecturer, he became on March 1, 1926, assistant to T. Gilbert Pearson, then President of the National Association of Audubon Societies. He remained with the Association in various capacities until October 1, 1941, Beginning in October, 1935, he spent two years on the faculty of the University of Florida with financial support from the Audubon Society, followed by four years devoted to lecturing before the state Audubon societies.

In 1941 he returned to Indiana and became educational representative of the Indiana Department of Conservation. Aside from his heavy schedule of lectures, he wrote a series, 'Songbirds of Indiana,' for 'Outdoor Indiana,' 'Permanent Bird Residents of Indiana,' and contributed articles to 'American Forests' and 'Audubon Magazine.' He is survived by his widow, Mrs. Bertha M. Hadley, Mooresville, Indiana; a daughter, Mrs. Glenn W. Smith, Madison, New Jersey; and a son, Paul A. Hadley, Elza, Illinois.—A. W. SCHORGER.

GEORGE MACREYNOLDS, an Associate of the American Ornithologists' Union since 1917, died in Doylestown, Pennsylvania, October 27, 1950. He was born there on August 25, 1861. Following his education at the Doylestown Seminary, he was employed by the Doylestown 'Democrat.' He rose to the editorship, a position he held for 30 years. During his 43 years in newspaper work, he was also connected with the South Bethlehem 'Star' and the Pottstown 'Blade.' The last 16 years of his life he was librarian of the Bucks County Historical Society. His historical bent resulted in the writing of 'Place Names in Bucks County' and 'The History of the Doan Outlaws' (MS).

Mr. MacReynolds was greatly interested in nature, serving as president of the Bucks County Natural Science Association and secretary of the Bucks County Fish, Game and Forestry Association. His paper, 'The Birds of Bucks County, Pennsylvania' (Bucks Co. Hist. Soc. Papers, 7: 1–63, 1937), is particularly valuable for the information on the changes in bird-life, He never married. Surviving him is a sister, Miss Gertrude MacReynolds, Doylestown, and two brothers, Major Abel MacReynolds, Spring Valley, Pennsylvania, and Nelson MacReynolds, Miami, Florida.—A. W. SCHORGER.

JOHN EDWARD MAHER, an Associate of the American Ornithologists' Union, elected in 1902, died in Jersey City, New Jersey, on April 19, 1950. He was born in Suffield, Connecticut, in 1876. His profession was that of printer and proofreader. Though having a great interest in nature, ill health and living in a city apartment prevented him from studying birds in their natural surroundings, except to a limited extent.—A. W. SCHORGER.

WILLIAM WHITE MCCALL, an Associate elected in 1921, was born in Philadelphia, Pennsylvania, January 21, 1868. Death occurred at Haverford, Pennsylvania,

September 16, 1949. He was associated with The Pennsylvania Company for Banking and Trusts, where he was beloved greatly by his associates. Among his hobbies were fishing and the restoration of old furniture, at which he was very skilful. He was a member of the Delaware Valley Ornithological Club. During the last years of his life illness prevented attendance at the meetings. While birds were his chief interest, he found all phases of natural history to his taste and the home housed numerous living examples from cocoons and alligators to birds. He told his children a series of 'Pond Stories' accompanied by artistic illustrations. McCall was one of the class of naturalists who found nature so absorbing that he was never moved to put his observations into print.—A. W. SCHORGER.

JOHN THOMAS MINER, generally known as "Jack Miner," an Associate of the American Ornithologists' Union, elected in 1927, died suddenly in Kingsville, Ontario, November 3, 1944, at the age of 79. He was the son of John and Anna Broadwell Miner and was born April 10, 1865, at Davis Centre, a suburb of Cleveland, Ohio. During the winter of 1878 he attended school for three months, the only formal education he ever received. At the age of 11 he went to work in his father's brickyard making bricks with a hand press. On April 22, 1878, the Miner family moved to Kingsville and took up residence in a log cabin where, four years later, he and his brother located brick clay and engaged in making bricks.

In 1904, Jack Miner conceived the idea of converting the ponds in the excavations, caused by digging clay for making bricks, to a refuge for wild fowl. Five years later he tagged a Black Duck with his address to ascertain where it would spend the winter. This duck was killed at Anderson, North Carolina. Later he concentrated on tagging wild geese and placed a verse of scripture on the back of each tag. These tags were taken by the Indians in the far north to the nearest missionaries and returned to Miner, who by 1915 had tagged nearly 31,500 Canada Geese. Corn was raised to feed the geese. Groves of trees were planted which attracted nesting Mourning Doves from far and near. Wood Ducks were raised, banded, and liberated. The place was made a government sanctuary and protected by an Order in Council prohibiting shooting within a mile of the refuge. An annual grant was made by the government of Canada, and Miner was appointed a part-time warden. In 1943, a year before his death, Miner received from His Majesty King George VI, the decoration O. B. E., Order of the British Empire, "for the greatest achievement in conservation in the British Empire." Since Miner's death the Jack Miner Sanctuary has been maintained by his son Manly Miner with the aid of government grants and contributions by many friends of conservation interested in this project.—T. S. PALMER.

LESLIE LORAINE PONTIUS, an Associate of the A.O.U. since 1948, was born in Tarlton, Ohio, October 22, 1883, and died in Circleville, Ohio, February 23, 1950. His education was received in the Tarlton schools. He was in Government service for 32 years and at the time of his death had retired as Assistant Postmaster. His writings on birds are contained in "Joy Walks," a series of articles contributed to the Circleville 'Herald.' Plant life formed his major interest and he became an accomplished field botanist. His herbarium is now at Ohio University, Athens, Ohio. He contributed specimens also to the Smithsonian Institution, Ohio State University, University of Pennsylvania, and the New York Botanical Gardens. He was an active member of the National Audubon Society, Ohio Academy of Science, Wheaton Club of Columbus, Sullivant Moss Society, and two garden clubs in Circleville.—A. W. SCHORGER.

KATIE MYRA ROADS, a Life Associate of the American Ornithologists' Union, elected in 1929, died in Hillsboro, Ohio, October 3, 1949. She was born in Ohio on June 25, 1875. Between 1925 and 1938 she published eight notes in 'The Auk' and 20 in the 'Wilson Bulletin,' the majority pertaining to the nesting habits of birds. A particularly interesting observation was the killing and eating of newly-born lambs by the Black Vulture (Wilson Bull., 46: 219, 1936).—A. W. SCHORGER.

MARY HALL SCHAUB (Mrs. J. Benton Schaub), an Associate of the American Ornithologists' Union, elected in 1943, died in Wilmette, Illinois, April 15, 1950. She was born in Rising Sun, Indiana, January 16, 1892. Graduated from Hanover College, she took additional work at Valparaiso University, Northwestern University, and the Art Institute of Chicago.

Mrs. Schaub was a member of the Wilson Club, Chicago Ornithological Society, Inland Bird Banding Association, Eastern Bird Banding Association, and the Chicago Academy of Sciences. Her activity in bird banding, begun in 1930, continued to the time of her death. She served as director of the Illinois Audubon Society, and president of the Evanston Bird Club and of the William I. Lyon Bird Banding Council. Aside from birds she was chiefly interested in botany and art. She amassed an outstanding collection of slides of wild flowers in their natural colors, which were used in her lectures, and worked in oil on landscapes and flower arrangements. She was a life member of the Art Institute, member of the North Shore Art Guild of Chicago and the Evanston Art Center, and served as president of the Wilmette Garden Club and chairman of the Art Department of the Wilmette Women's Club. In addition she devoted much time to the Covenant Methodist Church and its collateral interests.—A. W. SCHORGER.

GRACE MARION SNOW, an Associate of the American Ornithologists' Union, elected in 1922, died in Winchester, Massachusetts, on February 6, 1950. She was born in East Boston, Mass., November 5, 1874. In 1897 she was graduated from Boston University College of Liberal Arts with election to Phi Beta Kappa. She was proofreader and bookkeeper at the Taylor Press for many years. Deeply religious, she taught in the Methodist Sunday School for over 50 years and served as President of the Women's Foreign Missionary Society for 20 years.

A requirement, during a period in her youth, that she take exercise in the open led to an interest in birds that became a fascinating pursuit. She joined the Brookline Bird Club about 1922, serving as its secretary, and was also a member of the Massachusetts Audubon Society. She will be remembered for the aid given to others having a similar interest in ornithology.—A. W. SCHORGER.

WILSON TOUT, an Associate of the A.O.U. since 1935, died in North Platte, Nebraska, June 18, 1951. He was born in Sutton, Nebraska, May 18, 1876. While attending the University of Nebraska, his friendship with Prof. Lawrence Bruner stimulated his interest in ornithology. After leaving the University he engaged in teaching and was Superintendent of Schools in North Platte for most of the period to 1920. In this year he became owner and editor of the 'Lincoln County Tribune.'

Mr. Tout was a member of the Wilson Club, Nebraska Ornithologists' Union, and the American Society of Mammalogists. In April, 1934, with Mrs. Tout, he established the North Platte Bird Club. Husband and wife were active in banding and several hundred birds were handled. He was the author of approximately 30 papers that appeared in the 'Proc. Nebr. Orn. Union' and 'Nebr. Bird Rev.' "The Ducks of Lincoln County, Nebraska" appeared as Publ. North Platte Bird Club, No. 3, 1937. The observations of 40 years culminated in "Lincoln County Birds,"

pp. 1–191, 1947, privately printed. Prior to its appearance, an account of one species was published weekly in his paper and the type saved until sufficient had accumulated to print a signature. Outstanding in his character were orderliness and thoroughness, and he was beloved by his associates for his gentleness, modesty, and kindly wit.—A. W. SCHORGER.

BERNARD, WILLIAM TUCKER, elected a Corresponding Fellow of the American Ornithologists' Union in 1941, died in Oxford, England, on December 19, 1950. He was born at Northaw, Hertfordshire, on January 22, 1901. From Harrow School, where he won a prize in biology and a scholarship, he went to Magdalen College, Oxford, and was given first class honors in 1923. The year 1924 was spent at the Zoological Station, Naples, investigating parasitism in crustacea. He was married to Gladys Allen in 1925 and in this year was appointed Demonstrator in the Zoological Laboratory, Cambridge.

What may be considered the turning point in his career, was his return to Oxford in 1926 as University Demonstrator in Zoology and Comparative Anatomy, a post held until his death. Here, under the influence of Rev. F. C. R. Jourdain, ornithology became his main vocation and he pursued it with zeal. Tucker was first and last a field ornithologist. Many of his summer vacations were spent on the continent studying birds at various localities from Lapland to southern Spain. Nearly all of his publications, approximately 40, relate to field observations, an exception being, 'On differences in the microscopic characters of the crown-feathers of tits of the genus *Parus* with particular reference to the marsh and willow-tits.' (Proc. Zool. Soc. London, 431–41, pt. 1: 1935).

Tucker was one of the principal participants in the recent augmentation of interest in birds in England. The Oxford Ornithological Society was founded in 1921 and he was its first Honorary Secretary. The British Trust for Ornithology was established in 1933, of which he was Vice-Chairman, and through it the Edward Grey Institute was set up at Oxford. The latter was kept alive in the university only by his personal solicitations. He became Reader in Ornithology in 1946.

When 'A Practical Handbook of British Birds' went out of print in 1934, it was decided to prepare a more comprehensive treatise. Aided by the British Trust for Ornithology, this appeared in 1938 as 'The Handbook of British Birds,' in five volumes. In its class it remains without a peer. Tucker, as one of the editors, assumed a task for which he was eminently fitted. He prepared the sections on habitat, field characters, general habits, voice, and display.

We are indebted to him for contributions to the recent volumes of Bent's 'Life Histories,' covering the following European and Asiatic species that have occurred on the North American continent: Rook; Hooded Crow; Iceland Red-winged Thrush; Blackbird; Wheatear; Red-spotted Bluethroat; Greater Kamchatka Nightingale; Kennicott's Willow-Warbler; Mountain Accentor; White Wagtail; Meadow Pipit; and Red-throated Pipit.

Tucker became a member of the British Ornithologists' Union in 1922 and served as Vice-President (1947–49). On the death of Rev. Jourdain in 1940, he became Assistant Editor of 'British Birds,' and Editor in 1943 following the death of H. F. Witherby.

The loss to British ornithology by his death is great. However, he blazed a trail in bird study that will be followed in England and elsewhere.—A. W. SCHORGER.

THE AUK

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ORGAN OF THE AMERICAN ORNITHOLOGISTS' UNION

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